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EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES—GAS, &c.

Insurance Offices and Compensation.

WHILE the Council of the Institution of Gas Engineers are revolving in their minds whether anything can be done through them to secure for gas undertakings, from the insurance offices, terms, under the new Compensation Act, of a more reasonable character than the exorbitant ones already quoted, the support of several large gas undertakings is being lost by their several determinations to take upon themselves the more onerous risk rather than submit to the demands of the insurance offices. Of course, there is another way of looking at this gradual withdrawal of the interest of the large undertakings in any collective movement; and it is that their action will have the effect of hastening the breaking down of the exaggerated views of the insurance offices as to the addition to the risk that the new Act has imposed in the case of gas-works employees. The last undertaking of which we have knowledge that has receded from participation in any combined attack on the position of the insurance offices is, as mentioned recently (p. 559), the Liverpool Company; and previously we had noted the South Metropolitan, Sheffield, and South Suburban Companies, and the Edinburgh Gas Commissioners. Insurance offices have to bear this in mind, that they are driving from themselves the cream of the gas industry's business by their extravagant use of an opportunity; but there is no question they will have to climb down. We do not forget what Mr. Thomas Bower and Mr. Herbert Lees have told us of how the pressure brought to bear by the North of England Association, when the first Act came into operation, effected a reduction of the premium to 7s. 6d. and less per cent. on wages. And what happened then will happen again; and the sooner the insurance offices appreciate this, the greater the amount of business from the gas industry that will pass through their books. If they prolong the inevitable, the more undertakings will there be who will follow the example of those already named and possibly of others of prominent position of whose action we may not have heard.

We really cannot understand why the insurance companies have taken the view that 17s. 6d. and 12s. 6d. for the different classes of gas workers (with 3s. for the clerical staff) are fair premiums to demand under the new Act. There is nothing whatever in the experience of the past to justify such ideas. Taken as a percentage on the number of men employed, the risk in the case of gas-works employees cannot be nearly so heavy as in many other industrial occupations; and, indeed, with the greater adoption of mechanical operation in gas-works, there is less risk now than formerly. We have had contributed to our columns, by Mr. Hanbury Thomas, an excellent illustration from the experience at Sheffield of the modest amount of risk run by gas workers (*ante*, p. 248); and his computations are of guiding importance at this stage of the negotiations with the insurance offices. When the 1898 Act came into operation, it was determined by the Sheffield Gas Company's Board, on the direction afforded by prior experience, to set aside a sum equal to 6s. 8d. per cent. on the total wages, to meet the possible impositions of the Act. The amount accordingly set aside in the years since has been £2509, of which £1798 has been paid away in compensation, or 4s. 9·29d. per cent. on wages, compared with the provision of 6s. 8d. Had the Act passed in 1906 been in operation during the period, the amount of compensation that would have had to be paid would have amounted to £2286, or 6s. 0·84d. Under the circumstances, the amount of 6s. 8d. per cent. would have been sufficient; but it allows of no margin for any serious contingency. The Directors have therefore decided to set aside 8s. per cent. on the wages paid. Now this last figure is very interesting; and if the insurance offices really desire some corroboration as to its sufficiency, the experience of the South Metropolitan and South Suburban Companies may be offered. Excepting perhaps for the smaller concerns, Sir George Livesey is a firm believer in the advantages, for both men and companies, of "contracting out" of the Act; and this is a belief established on an experience of ten years in the case of the South Metropolitan Company, and five years in the case of the South Suburban Company. Last year accidents only cost the South Metropolitan Company an average of 4s. 9d. per man, or 5s. 6d. per cent. on wages; and this, be it marked, was not an exceptional year, but a fairly representative one. It is calculated by Sir George Livesey that the new Act will certainly not impose more than an additional 1s. 6d. per cent.; and therefore 7s. per cent. may be taken to cover the outside necessary provision in the case of that Company. This 7s. compares with Mr. Hanbury Thomas's 8s. per cent. on wages; so that at 8s., it would appear, we have the point of ample provision for fairly substantial undertakings. To go further, for ten years at Edinburgh, all claims arising out of the Employers' Liability and Workmen Compensation Acts have been paid out of current revenue. Totalling the claims paid, Mr. W. R. Herring has found that they average 2s. 9d. per cent. on the wages paid. Is it to be marvelled at, in face of the rates asked by the insurance offices, that Mr. Herring should have counselled the Gas Commissioners to continue their old practice, and let the insurance offices go their way without the gas-works business? At Bath, during the last six years, Mr. C. Stafford Ellery states, the claims received did not amount to anything like one-quarter of the sum paid in premiums.

In such a matter as casualties, the future can only be judged in the present by reference to the past; and we do think—having regard to past experience, the views of expert gas administrators as to a fair percentage on wages for premium, and the daily improving conditions in gas-works—that the insurance offices are making irrational demands upon the gas industry. Certain it is those demands have already deprived the offices of a substantial amount of business, and that they will not be entertained by many others.

Contracting-Out and Accidents Funds.

IN the foregoing article, the question is discussed as to what is, so far as can be calculated from past experience, a fair percentage on wages to provide for insurance under the new Compensation Act. A cognate question is that of contracting-out of the Act, with the provision of Accidents Funds, to avoid litigation between employers and employed. But, with the adoption of such a scheme, satisfaction has to be given that employers are not gaining an advantage at the expense of the legal rights of the men. A mutual arrangement, under definite rules, whereby contracting-out can be effected, must result not only in the avoidance of litigation, but in the prevention of strained relations, distrust, and the growth among the men of a sense of unfair treatment in forcing litigation, and so ruffling contentment. If contracting-out will maintain good relationships, then contracting-out of the Act is preferable to the Act itself, although the benefits to which the men are entitled may be made, at the money expense of the employers, superior to those payable under the Act. Like co-partnership, however, contracting-out does not spread in the gas industry. To the best of our knowledge, it only exists in the gas industry in the birthplace of co-partnership, and in the neighbouring South Suburban Company, which, as all in the industry know, is, like the South Metropolitan Company, governed, not merely by the usual commercial and industrial administrative laws, but by those unwritten ethical laws that are generated by co-partnership. There is no question that the co-partnership system does give a power in the matter of contracting-out that is not possessed by concerns where such a system is non-existent, though we do not go the length of saying that contracting out of the Act is impossible in the case of other concerns.

But in support of the main contention, the fact may well be advanced that, on a vote being taken of the workmen of the South Metropolitan Company, there were, even at those works, a few hundred (some of whom possibly did not understand what they were voting upon) who were in opposition to the Accidents Fund, while as many thousands were in favour. Had the system of co-partnership not been in existence in that Company, the probability is the numbers would have been reversed on account of one of the recognized difficulties to contracting-out.

For difficulties there are. The first does not apply generally, but it does in many cases. An undertaking must be a fairly substantial one, with a good number of employees, that can in this matter follow the lead in all respects of the South Metropolitan and South Suburban Gas Companies, but there are several of approximate size to the latter Company. And to all such, this subject must be of deep interest; for labour, backed as it is by a no small measure of law, has now made large inroads upon the consideration of all managements. A second difficulty is selfishness. Even though a Company might do as the South Metropolitan Gas Company and their neighbour have done—guarantee the financial stability of their Accidents Funds and the subscription of the necessary amount quarterly to make income balance expenditure, even though they show that they are doing something better for the men than the men would be getting under the Act, still in many works where relationships are not of the order obtaining in South London, there would be men who would sway their fellows to a suspicion of hidden advantage to the employers, and of the "some-"thing better" being a delusion and a sham, and not the equivalent of what would be obtainable through the Law Courts if to the Courts there had to be reference. Suspicion is a sinister enemy in large industrial establishments; and every effort should be made to avoid it. While, therefore, we are fully alive to the advantages of contracting-out of the Act in avoiding litigation and in maintaining good relationships, there is the feeling that something precedent is required to establish those good relationships and the utmost confidence to ensure smooth working. And the question is what are the best means of ensuring these precedent conditions? The most complete answer we believe is to be obtained at the gas offices in the Old Kent Road. This is merely an expression of our own opinion, and may not be acquiesced in by others. But we submit it as worthy of consideration in connection with a question of the hour.

The contracting-out and accidents fund schemes of the South Metropolitan and South Suburban Gas Companies is adumbrated by the rules, which we publish this week. Co-operation is at the root of the business of these Companies; and the scheme now before us is likewise based on co-operation in the prevention of accident, with co-operation in improving the financial condition of the sufferers by accident, without relieving in any way the Companies from any part of their legal financial responsibility. It seems almost paradoxical to say that the scheme will impose a greater cost per accident upon the Companies, and yet it will, or rather it is confidently expected that it will, save them cost in the total. The explanation is that co-operation will tend to the prevention of accidents; and that, as co-partners, it is to the interest of the men to do all possible to save expense to the Company. Their interest is a double one; being both co-partners and employees, with representation in administration. Under the scheme, the subscription of the men is a purely nominal one; but nominal though it be, a kind of sliding-scale has been applied to it. If the accidents are at the rate of 55 per 1000 men, the subscription is to be 1d. per man a month; if the accidents are at the rate of 40 and under 55, the subscription will be 1d. for every two months; and if under 40, 1d. a quarter. This nominal subscription will give the men a real interest in the fund, will diffuse among them the spirit of co-operation in its working, and will give them a large part in its management. The subscription of the men will only represent 12½ per cent. of the total cost; but the benefits assured to them in the event of accident are 25 per cent. higher, on the whole, than can be obtained under the Act. Thus it follows that of this 25 per cent., the Companies are making themselves responsible for 12½ per cent. beyond their legal obligations. The accident pay of the men is to be at the rate of 18s. a week, dating from the day of accident, but no claim can be made for less than three days' disablement. The 18s. means, on an average, a payment of about 1s. 6d. more than would be obtained under the Act. There are people who fear that this additional pay will increase the number of bogus accidents; but the system of juries (about which the rules also give information) and co-partnership supply very effectual safeguards for the Company and for those of their workmen who are too honest to descend to mean trickery, falsehood, and fraud. We like the idea of the men's subscriptions being varied according to the number of accidents, and of each station of the larger Company being treated separately. The rules appear on first acquaintance to be without defect; and it will be with interest that we shall watch the effect of their operation. Here we have not treated fully upon the benefits and conditions; those whose curiosity is aroused will naturally turn to the complete rules for further information.

Explosions in Electricity Culverts.

THE trouble occasioned by explosions in electricity culverts appears to be a perennial one; but, as time passes, the burden of these mishaps is being lifted, to a considerable extent, from distributed coal gas. There was a period when the electricians imputed all manner of insidious mischief to coal gas. It was their trading rival; and, in their short-sightedness, it could be none other than coal gas that was the cause of trouble in and to their underground electrical systems. It sufficed them that coal gas and air would form an explosive compound, which an electric spark would ignite, and occasion a dislocation of cables and upheaval of manhole covers and flagstones. But that it was possible there might be some other cause was more than they would admit, and most certainly they did not exert themselves to search for an alternative. Then in 1895 there was the Euston Road explosion, when Major Cardew, one of the Board of Trade Inspectors, found incrustations on the insulators supporting the bare copper strips by which the electric current was carried; and further light on the subject shows us that these incrustations are, with moisture, of themselves sufficient, without the aid of coal gas, to create all the conditions necessary to produce explosions. We know, too, that an overheated cable with bitumen covering will generate gas; and, in a report from Aberdeen, a still more simple cause is now charged with being ample to realize an explosion and the dislodgment of manhole lids. Nevertheless, we cannot harbour the hope that electricians will not in future do all they can to entangle gas in their troubles, and attempt to make it a greater sinner than their own mischief-working systems. They seem to quite forget that, if it is a leakage of coal gas into their systems that causes the trouble, that leakage will not be discontinued by the explosion, but more likely will be worsened, and so be easily traceable. While arraigning gas systems for not being gas-tight (though gas suppliers have everything to gain by keeping the commodity they distribute in safe custody until sold), electricians also lose sight of the fact that electric wire culverts and boxes are frequently in such a condition that they give ready entry to accidental escapes of gas. Moreover, electricity has a bad habit of escaping from electricity distribution systems, and taking revenge upon gas-pipes in its own evil way, and in a way contributing to leakage. Gas suppliers are quite alive to the necessity of doing all possible in the interests of public safety; but electricians must not imagine that they are altogether blameless.

What has happened at Aberdeen? In the later nineties, there were explosions in electric light culverts; and manhole lids and flagstones were uplifted, and much damage was occasioned. These disturbances appear to have happened chiefly in culverts in which copper strip mains were carried. But coal gas was almost invariably accounted the cause, though sewer gas was occasionally suspected. Then three or four years ago the explosions took place at shorter intervals, and they have continued. But it does not appear to have occurred to anyone to see whether the Euston Road experience, and the valuable information contained in Dr. Bassett's paper read before the Liverpool Section of the Society of Chemical Industry (*ante*, p. 572) regarding the formation of incrustations of potassium and sodium hydroxides with free alkali metals, could be brought to bear upon the experiences in the culverts containing the bare copper strip mains at Aberdeen. We suggest that it is not now too late to give some attention to this question. But the more frequent recurrence of the explosions did do something for coal gas. It was exonerated in a few cases; and experiments resulted in the unveiling of a number of interesting facts. A temporary culvert with some boxes was constructed in the

electricity station yard, within the confines of which it may be imagined coal gas is not to be found, and trials were made with this structure. There is, however, a fault to be found with the investigations—that the conditions existing in the ordinary distribution system could not have been completely reproduced, inasmuch as a limited time and non-continuity of use were against the production of the state of things found in the Euston Road culverts a dozen years ago and of that described in Dr. Bassett's paper. But, restricted as these trials were, they proved that it was possible for an explosion to occur without the presence of coal or other explosive gas. The inquiry was made to ascertain "whether any explosive "gas was generated from the insulating material by the "intense heat of the fault [purposely created]; and it was "found on experiment that a piece of bare copper wire—if "short-circuited in the culvert—would create the same ex-"plosion, provided electrical energy sufficiently powerful "were applied. The experiments tended to show that the "explosions were in many cases brought about by the sudden "heating and consequent expansion of the air in the man-"hole and culvert." Cutting a ventilating hole in a manhole cover was not found sufficient to make any difference in the height the cover was lifted. The upshot is that the copper strip culverts in Aberdeen are now to be replaced on the solid system. It would have been better if the experiments had been carried out before the heavy outlay of the last eight years was made in the endeavour to remedy a condition of things that was not completely understood. However, the gas industry are indebted to Aberdeen for the investigation that has been made, and for the report thereon. That document (which we reprint in our "Miscellaneous "News") and Dr. Bassett's paper should induce more care on the part of electricians before indicting gas as the sole cause of explosions in their culverts and boxes.

The Old Order Changeth.

An important section of the "Journal" this week is devoted to the description of some of the new goods that the manufacturers of gas-fires and lighting appliances have produced or specially recommend for the coming season; and there are yet the novelties of other firms to notice before we complete the record. There has been much interest—both general and technical—extracted from the preparation of these accounts. In the first place, as we look down the lists of the names of the firms engaged in the manufacture of these appliances, the thought crosses the mind that for them the gas industry must be a very attractive trading field. In mind, we turn back to the period when the firms who had any considerable connection with the gas industry in the manufacture and supply of gas-lighting fittings and burners, could be counted on the fingers of one hand. Now——well, we have no particular concern in spending time in the attempt to count them. Incandescent lighting has changed the old condition of limited number, and has given place to the new. The old firms, too, who established their names and reputations in pre-incandescent days have, to their advantage, marched with the times; otherwise they would have been left in the rear by the fresh enterprise attracted to the gas industry. Not only have the firms multiplied and individually expanded, but the capital and labour employed in the production of appliances have had a manifold increase. The scientific advance and commercial prosperity of the gas industry have indeed opened up, to surprising extent, many channels in new directions.

Read down the accounts of the new goods now being put on the market, and see how almost completely, in the domain of lighting, the manufacturers are diverting their attention from the vertical incandescent burner to the inverted. This is significant of both efficiency and demand; and we look for still greater things. In the descriptions of burners, lamps, and fittings we also trace the line of progress. We see the shrinkage of gas consumption per burner; the higher illuminating duty per cubic foot of gas consumed. We see the appreciation on the part of the manufacturers of the important parts that regulation and cleanliness play in efficiency, and the provision for giving effect to these requirements. One drawback to inverted burners has been the discoloration and incrustations upon the metal heads and supply-pipe above. Two or three firms have dealt with this objection (which has only been tolerated on account of the excellence of lighting and, with the indicted exception, the decorative effect of the inverted burner); and one firm in particular have produced lamps about which we may say that it will surprise us much if they are not a success in permanently obviating all difficulty in this respect. Fittings and glassware, too, have more artistic merit than of yore. In the fittings provided for the bijou form of inverted gas-burners, we have examples of work that will vie with the best that has ever been produced for the carbon filament electric lamp. In glassware, the conditions favour greater artistic merit for gas; for no carbon filament electric lamp will stand being ensconced in a fancy coloured globe without forfeiting its usefulness as a light-giver.

The same with gas-fires. Improvement in efficiency and in the provision for the maintenance of the fires in good condition has been considerable. There are, it is true, croakers and grumblers about this point and that point; but we have never yet found a complainer in the ranks of the gas profession who could say to the gas-fire maker, "I can show you "how to produce something better." We all desire to secure betterment, and to cure defect. At the same time, we are not at all dissatisfied with what the gas-fire manufacturer offers to-day; and this can be said while still hoping for something better. But take the fires of to-day, and compare them with the fires of merely a few years past; those who cannot distinguish advance are suffering from an extremely obtuse comprehension. Advance is, as a rule, made by gradual steps; and we do not expect that in gas heating such a revolution in idea and system will ever be made as was effected in lighting in one step by Welsbach. But in gas heating as in gas lighting, "the old order changeth, and giveth "place to the new."

The Manchester Gas Exhibition.

The particulars received from Mr. H. Kendrick, one of the Honorary Secretaries to the Advisory Committee, which are given on another page to-day, are sufficient to show that a very strong bid is to be made for the favour not only of those connected with the gas industry, but also of the general public, in connection with the extensive Gas Exhibition that is to be opened in Manchester next month. There will be, according to the arrangements, an influential gathering of gas men at the opening, which is to be performed by the Lord Mayor of Manchester, assisted by the Mayor of Salford. Alderman R. Gibson, J.P., the well-known Chairman of the Manchester Gas Committee, is to occupy the chair; and the Council of the Institution of Gas Engineers will be present, together with numerous leading public men of the district. In the evening, the Advisory Committee are to entertain those taking official part in the ceremony and the Institution Council to dinner. Once started under such auspicious circumstances, the exhibition should straightway "catch on." All the arrangements are clearly in an advanced state; and the programme as foreshadowed is a highly attractive one. There are to be technical lectures by gentlemen whose names may be confidently relied upon for drawing good audiences; while for the general public, cookery lectures and cookery competitions have been arranged. The exhibits themselves will, of course, be on an extensive scale; and when all things are considered, it will be a surprise indeed if the Manchester Gas Exhibition does not turn out to be the signal success that is merited by the efforts of those who have been instrumental in organizing it.

The Accounts of Borough Councils.

From Part V. of the Annual Local Taxation Returns, which (though it was only issued last week) refers to the year 1904-5, there have been taken some figures which will be found in another part of to-day's issue. These Blue-Books (relating, as they do, to a subject which affects nearly everybody either directly or indirectly) are of much value for comparative purposes, though a considerable amount of courage must be summed up if one intends to dip very deeply into the volume which is now the subject of notice. It consists of over 400 pages—all of them, with the exception of a brief summary of the contents, being filled with column after column of figures. The information given is on the subject of the accounts of councils of boroughs other than Metropolitan boroughs, and those of urban district councils. The former only are noticed in this issue of the "Journal," as the "cherry" is one that quite well admits of two "bites" being taken at it. At the end of the year referred to, there were—exclusive of the City of London and Metropolitan Boroughs—

324 boroughs in existence, of which 71 were county boroughs; and the figures relating thereto are necessarily of very great magnitude. The total amount of loans at the conclusion of the period under review was no less than £232,244,589. This enormous sum, has, of course, been spread over a great many different branches; but by far the largest single item is water-works, on account of which a sum of £57,553,666 is outstanding. Gas-works (£19,753,565) and electric lighting (£18,794,239) come fairly close together; and between the two are tramways and light railways (£19,496,463). In considering municipal work at the present time, it would, of course, be unfair to omit reference to the burden of education cast upon the authorities, which the Blue-Book shows to be responsible for loans outstanding to the amount of £17,414,137. Another essential item is public roads and streets, for which there are loans of £26,303,292. The total rateable value of the boroughs is close upon £70,000,000; and the population, according to the last census, was about 13¾ millions. The table that is likely to be of most use to controversialists, as well as of greatest general interest, is that which relates to the transfers in aid of rates out of profits from, and the transfers from rates to make up deficiencies in revenue on account of, what are termed the "reproductive" undertakings. The particulars that have been gathered from returns made to the Local Government Board show that for the year 1904-5 there was a total profit of £898,742, and a loss of £242,472. By far and away the largest profit was made from gas-works, which were also responsible for very much the smallest loss. The losses on some water-works total to a considerably larger sum than do the profits on the others; while with regard to electric light undertakings the total losses shown in some cases come to much more than half the profit arrived at in others. Before leaving the subject, it may perhaps be again mentioned that the figures dealt with this week refer to the borough councils only, and not to the urban district councils, whose affairs occupy another section of the Blue-Book, and will be subsequently noticed.

Municipal Profits and the Rates.

The question of local government generally, and of municipal trading profits in particular, was dealt with at considerable length in a "breezy" speech delivered last week by Alderman David Wade, when presenting to the Bradford City Council his annual statement in reference to the trading departments of the Corporation. After he had sat down, one or two of his fellow members professed to have seen in what had been said great cause for mirth; but it seems, on the contrary, that there was in the Alderman's arguments sufficient food for quite a lot of reflection. Briefly, the case he put forward was that, while the receipts and expenditure of the Corporation's many trading departments should be so regulated as to leave sufficient margin for possible contingencies, the making of large profits simply revived the old question of direct *versus* indirect taxation. Taking the trading departments as a whole, the aggregate net profit shown a year ago was £365; and though this has been increased on the present occasion, it has only been in consequence of an equation scheme in connection with the water-works debt, which has resulted in substantial relief. Under these circumstances, the Alderman asked the Council whether, as advocates of the principle of cost price, their ambition had not over-reached itself. But by providing for contingencies, he did not mean the allocation of large profits to the relief of the rates, because he further put it to the Council as a proposition that, on general lines, ratepayers, who were legally the owners of all the public services within their area, could never make a profit out of themselves. Here it may be remarked that though, referring to the ratepayers as a whole, the proposition may be accepted, it is nevertheless a fact that the community can realize a surplus at the expense of individual members of it. That is to say, the electric light user can benefit himself by making the gas consumer pay such a price for his gas as will result in a large profit being allocated to the reduction of the rates. In this case, the gas consumer does not get back in lower rates all the extra sum he has paid for his gas, because non-consumers share the profits with him. And even if everyone used gas, small ratepayers might consume a lot and large ratepayers only a little; so that though taking the ratepayers as a whole—as a "conglomerate body," as Alderman Wade termed it—cost price and higher poundage rates may be the same as surpluses and lower poundage rates, in individual cases the two things are very different indeed. This is a further argument in favour of the Alderman's apparent desire to sell the municipal commodities as cheaply as possible, and save the shilling in the pound income-tax, otherwise handed to the Government—"just for the passing glory of a paper surplus."

National Free Labour Association.

With the air once more full of rumours of strikes, it is not without curiosity that one turns to the annual report of the National Free Labour Association—the fifteenth, by the way—which has just made its appearance, as a reminder that Trade Unionism has not by any means got all the field to itself. The Association numbers in its ranks 600,000 men; and during the past year 256 employers made application for workmen. It is thus a good deal more than a name; and at any rate in so far as it maintains the right of a man to decide whether or not he will belong to a Trade Union, the organization is one that is worthy of sympathy. It is impossible to dispute the justice of the contention that a man who prefers to be independent and free to dispose of his labour as he may deem best should not be deprived of his right to do so; and that there should be no power on earth which can deprive an employer from engaging the services of such a person, when both are willing to contract and agree upon the terms under which the service is to be rendered. A workman who finds he is not in sympathy with Trade Unions, but who (through fear of the loss of privilege to earn a livelihood in peace and unmolested) is forced to join one, is subjected to the self-same abridgement of personal liberty as is the employer who is coerced and intimidated into employing none but Union labour. The most important strikes defeated during the past year in which the services of the Association were invoked, were those of the Hull engineers, the Liverpool and Birkenhead iron-moulders, the Sheffield locomotive engineers, the Staffordshire engineers, the Leeds brassmoulders, and the Sheffield pattern-makers and steel dressers. The Association has therefore done something to justify its existence; and workmen as well as employers should be thankful for every step that is accomplished in the direction of breaking down, wherever it exists, the tyranny so frequently exemplified in connection with Trade Unions.

The entire length of the Bath road in the Hounslow district has been treated with a preparation of liquid tar as a dust preventive. The results are stated to have proved very satisfactory from the standpoint of the residents on the line of route. It is generally admitted that since the work of surface-dressing was completed the nuisance from dust has been greatly minimized.

Mr. Edwin Maidstone Pearson, of Edstone Hall, Wootton Wawen, Warwickshire, the Chairman of Messrs. Wilson Carter and Pearson, Limited, coal factors and exporters, who died in March last, left estate valued at £78,839 gross, with net personalty amounting to £40,538. Among the bequests are 250 shares in the Company and his thanks for their kind assistance and active co-operation to each of his assistants, Charles Ernest Murray, Alexander Watson, and Frederick Harry Tipley.

The wedding took place on Monday the 2nd inst., of Mr. Harry Pickford, the Manager of the Farnworth and Kearsley Gas Company, who a few years ago succeeded the late Mr. T. L. Sheppard. The bride was Miss Louisa Ainsworth, daughter of the late Mr. William Ainsworth. On the previous Saturday, a deputation representing the employees at the gas-works waited upon Mr. Pickford; and Mr. Ennion, the foreman, as the oldest employee, asked his acceptance of a handsome clock as a token of their esteem and good wishes.

The divining-rod expert who was sent by the German authorities to their colony in South-West Africa has been unsuccessful in his attempts to find water. It is stated that he succeeded in only one place—a valley where a chalk formation contained a great deal of water, and wells would have been successful if driven anywhere. In other places his predictions that water would be found at depths of 90 to 215 feet proved entirely wrong, as borings were carried down much below the indicated depth of the water-bearing stratum, but were perfectly dry.

"The connection between radium and the safe working of collieries does not at first sight appear to be a very intimate one," says "Nature;" but the discovery announced by Professors Elster and Geitel in "Die Welt der Technik," that fire-damp contains six or seven times the amount of radium emanation that is generally found in the air of coal mines, brings the two into close relation with each other. According to our contemporary, "comparative tests of the electrical conductivity of the air due to the presence of the emanation can readily be made by means of a simple aluminium foil electroscope; and as only a comparatively small sample of the gas is necessary, the tests may be carried out outside the mine. It will be interesting to see the electroscope become part of the normal equipment of a colliery."

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 781.)

It was only natural that business on the Stock Exchange should be on a very restricted scale last week; for, in addition to autumn influences, a Hebrew festival lightened the load, and the fact of its being Account week kept fresh business under. But in spite of all this, more cheerfulness asserted itself from the start, and robustly maintained its position up to a point when other considerations had their turn. These were mainly the usual and almost inevitable realizations to secure profits after a rise. But they were not formidable. The factors at the opening were favourable; orders to buy for investment again appeared; and the fine weather, conducive to good traffic, had a brightening effect on Rails. Consols rose $\frac{1}{16}$. The cheerful and buoyant spirit animated Tuesday's dealings also. Consols gained another $\frac{3}{16}$, and most other markets smiled sympathetically. Wednesday was fully as fair, with the prospect of a light and easy account; Consols and Rails were still on the up-line; and so the general position continued through the following day. On Friday, the process of profit-snatching supervened, and a more or less general check was sustained all round. On Saturday, things did not mend; Rails being specially dull as they awaited the Labour *coup de théatre* of the next day. In the Money Market, there was an abundant supply, which the moderate demands of the week could make no impression on; and rates for discount, after some oscillation, closed easier. In the Gas Market, the volume of business was much about on a level with the week before. The general tendency was quite favourable; and all the six or eight changes in quotation were in the upward direction. In Gaslight and Coke issues, a fair amount was done in the ordinary at even figures, ranging from 93½ to 94⅝. Of the secured issues, the maximum was most dealt in at from 86¼ to 87½; the preference was done at 105; and the debenture at 83. South Metropolitan was very quiet, with only four transactions at from 120 to 120½. Commercial, on the other hand, was much more active; and the 4 per cent. changed hands several times at from 102¼ to 104. In the Suburban and Provincial group, Alliance old fetched 20$\frac{15}{16}$ and 21, British 42¼, Brentford new 187 and 188, South Suburban 115, Wandsworth "B" 128, and West Ham 103 and 103½. The Continental Companies were inactive. Imperial marked 175 and 175½, ditto debenture 91½, Union 114, and European fully-paid 23¼. Tuscan debenture was done at 101 and 101½. Among the undertakings of the remoter world, Bombay new changed hands at 4$\frac{31}{32}$ and 5, Buenos Ayres at 11$\frac{3}{32}$, Hong Kong at 19⅞, Monte Video at 11¼, Primitiva at 7⅛, ditto preference at 5⅛, ditto debenture at 95¼, and River Plate at 13⅜.

ELECTRIC LIGHTING MEMORANDA.

The Visual Depreciation of Low Power Street Lighting by Excessive High Powers—Variegated Electric Lighting—Dirty Lamps and Artistic Columns—Failures Produced by Small Causes—The Parliamentary Session—Power and Supply-in-Bulk Companies.

Data respecting public lighting are always interesting in view of the keen competition between gas and electricity for the supply of the street lamps. To Mr. Francis Teague, the City Electrical Engineer of Bath, we are indebted for particulars of the results of his inquiries on the subject in 41 towns. The character and type of the lamps used in street lighting are much a matter of individual preference on the part of town officials; but it is the electrical engineer who has done more than anyone else to introduce into our streets a grotesque disuniformity of illumination. Upon this point, Mr. Teague's report is silent. Electrical engineers employ in some streets strong centres of illumination, the diffusive power of which is small in comparison with the candle power; and, in different parts of the streets of a single town, flame arc lamps, and arc lamps of the open and enclosed types are to be found. Then again in some towns Nernst and electric incandescent lamps are also fixed; while, in other parts, ordinary incandescent gas-lamps are plentiful, for the sake of economy and efficiency. What are the results? The disparity of lighting by the use of the large candle power but concentrated illumination lamps has been hugely increased; and the colour of the illumination has been variegated. But perhaps there are people—electricians for instance—who prefer this variety to what they would describe as a monotony of intensity in illumination, however desirable that may be in the causes of good lighting, safety, and eyesight. There is still another effect. The high illuminating power lamps cannot—economy forbids—be placed in the side streets. Consequently, pedestrians and drivers of vehicles pass from streets containing the excessively high illuminating power lamps into those less brilliantly illuminated (but which were formerly regarded as being well lighted), and to their eyes—having just been under the influence of the glare of high-power lamps—these streets appear to be in almost dense blackness. There is no necessity for this. We walk in the streets of London suburbs that are lighted by ordinary low-power (say, 60 or 70 candle power) incandescent gas-lamps; and the streets are well lighted. We turn from a main street in London illuminated by high-power flame arcs into residential thoroughfares illuminated by low-power lamps; and the eyes take some minutes to get accustomed to the illumination afforded by the much lower candle power lamps employed, though they are the same that are efficiently lighting suburban roadways bordered by residential premises, gardens, and trees. If in the main streets lamps of good, but of less intense and localized, illuminating power were used at more frequent intervals, the eyes would not be so strained that a sufficient illumination for all purposes in the side streets is rendered artificially deficient. In other words, there is a visual depreciation of the low-power lighting by the use of the excessively high-power and eye-abusing lamps.

To turn to Mr. Teague's figures. The number of arc lamps installed in the 41 towns is about 12,000. But seven of the towns have upwards of 500 lamps; Edinburgh has 1176, and Glasgow 837. The average for the others is therefore not great. Of the total, 9377 of the lamps are of the open type, 2007 are of the enclosed type, and only 377 are flame arc lamps. Seeing that 105 of these flame arcs are in use in Hastings, and 105 are being erected in Hackney, there are only 110 flame arcs left to divide among the remaining 39 towns, or an average of rather more than four per town, which suggests that there are many electrical engineers who are not altogether favourably disposed towards the flame arcs. It is interesting to note that the flame arc lamps at Hackney and Hastings are of the magazine type; and it would be of value to know whether the reduction of labour for trimming produced by the magazine is more than counterbalanced by the increase in the cost of repair brought about by the magazine mechanism. In 29 of the 41 towns incandescent and Nernst lamps are also used; the total number of lamp columns bearing such lamps being 8760. This shows that electrical engineers are not of one mind as to the use of these inefficient lamps for street purposes, with all the worry and complaint that they bring in their train. Another point is that the number of arc lamps trimmed and cleaned per day per man varies from 30 to 100. Upon this point, the "Electrician" remarks: "At the present time, when the competition between electricity and gas for street lighting is so very keen, it is specially important that arc lamps used for public lighting should be maintained in as efficient state as possible. Arc lamp columns have the advantage of being more artistic than any gas standards yet devised; but dirty or badly illuminated arc lamp globes are very conspicuous, and are more noticeable than broken gas mantles." This reproof is much needed, not only in London, but in several provincial towns; and it is to be hoped it will be heeded. But we are not going to admit that electric lamp columns are more artistic than gas-lamp columns. Some very ugly arc lamp columns are to be found, and some of good design. Old-fashioned and ugly gas-lamp columns and artistic ones are likewise in existence. The sweeping and dogmatic assertion of our contemporary is certainly not justified. It is the parsimony exercised by local authorities towards the older illuminant and their misplaced generosity towards the newer one that gives partial truth to our contemporary's assertion, and nothing more. What reason is there that tall ponderous creations should be more artistic than shorter and lighter structures? Artistic gas-lamp columns can be made more cheaply than artistic arc lamp standards, and that is an advantage on the side of gas. Our contemporary also says that, "when the lamps are properly adjusted as regards voltage, careless centring of the carbons or worn guides may cause a poor and unsteady light." We are quite prepared to agree that these things not only "may" but do cause a poor and unsteady light; and however well lamps are adjusted to voltage, the wide fluctuations of pressure are often such a trial to the adjustment that the effect cannot be hidden from public gaze.

From little causes spring big results. It was only a defect in the boiler-feed arrangements at the electricity station on a Saturday night just recently that (so one report states) put Huddersfield in "almost total darkness" for over an hour. There are just two points about this statement that are peculiarly interesting. Firstly, the event occurred, as so frequently happens, on the worst night of the week—Saturday. Secondly, the report says the town was put into "almost total darkness." Have we been under a misapprehension in believing that Huddersfield possesses a gas undertaking of no mean order, and that the volume of business and the revenue considerably exceeds that of the electricity concern? If we have not been mistaken, then the report, in alleging that the borough was in "almost total darkness," overstated the effect of the defect in the boiler-feed arrangements at the electricity station. Then at Hull, it was only a fire in a pavement box that produced a considerable amount of inconvenience lately; certain places of worship being among the premises deprived of light. Places of worship ought not to commit themselves to any system of lighting that only provides so narrow a margin of safety.

A reviewer of the legislation affecting electric lighting in the past session has not much ground over which to roam. The session was a particularly slack one—in fact, in the past two years, there has been a dropping off in the number of applications for new or additional powers. We only count the confirmation of 23 Electric Lighting Provisional Orders last session; and there are a few local authority Acts which in small part include powers referring to electricity supply. There is also the North Metropolitan Electric Power Supply Company's Act; and in the Grays and Tilbury and Shanklin Gas Companies' Acts, electricity supply is mentioned. Regarding London, the preamble of the County Council (Electric Supply) Bill was not proved; the Administrative County of London and District Electric Power Bill was withdrawn; and

the London Electric Supply Bill (the one promoted jointly by the Companies) met with a similar fate. It is considered by the "Electrician" that, inasmuch as the existing County Council are not likely to promote another Power Bill, and as the promoters of the Administrative County of London Bill have given up their quest for powers, it is probable we have heard the last for some long time to come of the London power problem. May it be so. But it will depend upon the amount of influence that the Progressives can bring to bear upon a plastic Government whether or not there will be an early revival of the question. The interview leading Metropolitan Progressives had with the Premier and the President of the Local Government Board is still fresh in memory; and though the Premier is not desirous of having London questions brought forward in the session of 1908, he has made a promise that they shall not be neglected. The only other point of interest about the work of the session is that an electrolysis clause, at the instance of the Metropolitan Water Board, was inserted by a Commons Committee in the North Metropolitan Electric Power Supply Act; but it caught the eye of the Lord Chairman, and was promptly removed. Thus an individual who is not the King has the power of rejecting the work of a Parliamentary Select Committee. Just one more point. Our friends of the "Electrician" hope the President of the Board of Trade will find time to recast the legislation relative to electric supply. The hope is a right one. While Mr. Lloyd George is doing this, he might straighten out things as between the electricity and the gas industries by making compulsory the testing, under prescribed conditions, and the stamping of all electricity meters fixed in future, and within a defined period of all now fixed, and by prescribing penalty testing for electricity supply. The law ought not to be sterner for gas than for electricity.

The cry has been heard loud and long that the supply of electrical engineers is greater than the demand. If successful power and bulk supply companies covered the land, the cry would be still louder; for the positions available for the technically trained man would be very materially limited in number. We are told that the Yorkshire Electric Power Company are now supplying, or have contracts to supply, eleven electric lighting undertakings, are negotiating for several more, and the Brighouse Corporation are the last who have fallen into the Power Company's net. The Brighouse Council are going to discard their own generating station, take electricity in bulk from the Company, and then save money at the price of £6 per kilowatt of maximum demand, *plus* ¼d. per unit for all units consumed. But the charge made on this scale will not exceed 1·25d. per unit for the whole supply. When the Brighouse station has been superseded, what need will there be for anything more than a commercial manager, with sufficient knowledge of distribution and utilization to carry on the business? Such a man will be of less value than one with the responsibility of the generating plant as well as the work of generation on his shoulders. But the Yorkshire Company, notwithstanding their success in connecting up so many local authority supplies, were last half year short by £403 of making £4700 income cover works costs and administration expenses. It requires a big business in low-priced electricity to make a financial success of power and bulk supply. Meanwhile, the South Wales Electrical Power Distribution Company appear to be breaking up. The last piece of news about them is that the Bridgend Town Council are buying the Company's local generating station and network for £5000. The station cost £38,700! It's an ill-wind that blows nobody any good; but the shareholders of the Power Company have forsooth had a big share of ill-wind.

Junior Institution of Engineers.

A considerable number of members of the Institution last Saturday week paid a visit to the Hampton works of the Metropolitan Water Board, through arrangements kindly made by the President, Mr. William B. Bryan, M.Inst.C.E., Chief Engineer to the Board. Under the guidance of Mr. Walter Hunter, Assoc. M.Inst.C.E., Assistant Engineer of the Western District, and a member of the Institution, they were shown over the extensive works on the north bank of the Thames, comprising intakes, reservoirs, filter-beds, and pumping machinery for the supply of the western and southern districts; the former having previously been the West Middlesex and Grand Junction works, and the latter the Southwark and Vauxhall. The fine series of pumping-engines of various types, probably the most varied to be seen collectively anywhere, were examined with great interest. At the conclusion of the inspection, the party, assembling in one of the engine-houses, were entertained to tea by Mr. Bryan; and a vote of thanks was passed to him, on the proposal of Mr. Lewis H. Rugg, Chairman of the Institution. On Thursday afternoon, the 26th inst., an official visit of the Institution will be paid to the Engineering and Machinery Exhibition at Olympia.

Lectures at the Engineering Exhibition.—In view of the success attending the lectures delivered during the course of the Engineering Exhibition at Olympia last year, arrangements have been made for another series at the exhibition to be opened on Thursday. On Saturday, Mr. Hal Williams will lecture on "Gas-Engines and Suction-Gas Plants;" on the 28th inst., Mr. A. E. Battle will deal with "Sanitation and Ventilation;" and on the 10th prox., Professor Henry Adams will discourse upon "Ferro-Concrete."

THE FORTHCOMING MANCHESTER EXHIBITION.

READERS will be interested to learn the progress of arrangements in connection with the forthcoming Manchester Gas Exhibition; and Mr. Henry Kendrick (Stretford), one of the Joint Honorary Secretaries of the Advisory Committee, has forwarded information which enables us to state what has been settled up to the present time.

The official opening of the exhibition will be carried out at 3 p.m. on Oct. 23 by the Lord Mayor of Manchester, assisted by the Mayor of Salford; the chair being occupied by Alderman R. Gibson, J.P., Chairman of the Manchester Gas Committee. Alderman F. S. Phillips, J.P., Chairman of the Salford Gas Committee, is to be asked to take part in the proceedings, as well as dignitaries of the surrounding towns who are patrons of the exhibition. The ceremony will also be attended by the Council of the Institution of Gas Engineers, who will hold their autumn meeting in Manchester for the purpose; and it is hoped that some of the leading members of the Manchester District Institution of Gas Engineers will take a prominent part in the proceedings. The Manager (Mr. W. Cawood) will entertain the visitors and others after the ceremony. In the evening, also, the Advisory Committee will entertain those taking official part in the ceremony, and the Council of the Institution, to dinner at the Midland Hotel. Gas engineers and members of Gas Committees and of Boards, as well as representatives of the exhibitors and the Press, will be invited to be present.

Among the attractions of the exhibition, there have been arranged a course of technical lectures by Mr. Dugald Clerk, M.Inst.C.E.; Professor J. B. Cohen, Ph.D., B.Sc., of Leeds; Mr. J. W. Graham, M.A., of Victoria University; Mr. R. H. Clayton, B.Sc., F.C.S.; Mr. J. H. Brearley, of Longwood; Mr. J. G. Newbigging, M.Inst.C.E., of Manchester; Mr. S. Meunier, of Stockport; Mr. Tim Duxbury, of Oldham; and Mr. Kendrick. There will, in addition, be a course of thirty cookery lectures (delivered in the afternoon and evening) by Mrs. Middleton; while a series of cookery competitions for school children have been arranged, in connection with which some valuable prizes and diplomas will be awarded.

It may be mentioned that the list of exhibitors now numbers fifty-four; and there are eighteen in the model class—it being hoped to show a complete model gas-works, and many other interesting objects. In addition, there will be many processes in operation; and arrangements have been made to run a number of models and other exhibits with power produced on the premises. The lighting of St. James's Hall, where the exhibition is to be held, and the annexes, has been divided among eight firms of repute; and the question of ventilation has received very special attention. To the disgust of some of the local plumbers, an exceedingly generous spirit has been manifested by the Manchester Gas Committee, who, in addition to supplying the gas at a very low figure, have laid all the pipes in the hall right up to the stands, so that the expenses of the exhibitors in this respect will be extremely small.

Steps are to be taken to arrange for a meeting of the North of England and Midland Gas Associations during the exhibition; and a joint meeting of the Junior Gas Associations will also take place. In view of this, it is to be hoped that the Railway Company will see their way to grant some substantial concession in the matter of tickets. In this connection we learn that they have been asked to fix special fares for all gas-works people visiting the exhibition, as well as to arrange excursions from all the surrounding towns. The attendance will doubtless be largely augmented in consequence of the issuing by Mr. Cawood of slips to all gas undertakings in the area advertising the exhibition, and having a coupon attached admitting consumers at half price. These will be distributed with next quarter's gas accounts.

Enough has been said here to give ample promise of a thoroughly successful show.

MUNICIPAL INCOME AND EXPENDITURE.

Figures Gathered from the Local Taxation Returns.

WHEN noticing the Annual Local Taxation Returns, it is always necessary to point out that somewhat of their interest is lost owing to their lateness of publication. It is true that on the present occasion Part V. has been issued some five or six weeks earlier than was the case last year. Still, as it refers to 1904-5, it is even now (though perhaps unavoidably) more than a little belated. Nevertheless, the authentic character of the figures, and the completeness with which they are set forth in the formidable Blue-Book referred to, must be set against any shortcomings on the score of age, and render them of great value to those concerned in questions of municipal government. The statistics, it may be mentioned, deal with the accounts of the councils of boroughs (other than Metropolitan Boroughs) and of urban district councils. The present notice will be confined to the figures relating to the borough councils; leaving those of the urban district councils for a subsequent issue.

The number of boroughs (exclusive of the Metropolis) in existence at the end of the period embraced by the Blue-Book was

324, of which 71 were county boroughs. The variations, compared with the previous year, arise from the constitution during 1904-5 of one new borough (East Ham) and two county boroughs (Blackpool and Tynemouth). The accounts of the borough councils acting in their municipal capacity, show that the receipts (exclusive of borrowed moneys and of sums carried to the exchequer contribution accounts of county boroughs, but including transfers from such exchequer contribution accounts to other borough fund accounts) amounted to £18,640,668. Of this sum, £6,333,486 was from rates, and grants under the Agricultural Rates Act, 1896, and £5,134,573 on account of education. The expenditure (exclusive of that defrayed out of loans or charged to the exchequer contribution accounts of county boroughs) amounted to £18,179,154, including £8,841,062 spent on account of education. The principal items were tramways and light railways, municipal buildings, loan charges, police, salaries and superannuation and establishment charges, and public libraries, museums, and schools of science and art. The receipts of the borough councils in respect of tramway and light railway undertakings, excluding receipts from loans, were £4,484,234; while the expenditure was £4,096,917. The expenditure during the year by the councils acting as municipal authorities which was charged, or was intended ultimately to be charged, to loan accounts, amounted to £4,395,408; the separate headings being tramways and light railways, education, lunatic asylums, municipal buildings, bridges and ferries, public libraries, museums, &c., and police stations. The amount actually raised by loan during the year by borough councils acting as municipal authorities was £4,333,713—not including moneys borrowed under the Education (Provision of Working Balances) Act, 1903—while the repayments of principal and redemption of stock and annuities came to £1,172,546. The total amount of loans outstanding for the councils acting as municipal authorities (including loan debt transferred under the Education Act, 1902, and sums borrowed under the Education Act, 1903) was £55,196,737. Of this big total, the tramways and light railways are responsible for £19,496,463, and education for £17,414,137. The sums standing to the credit of sinking funds, loan funds, and redemption funds in connection with the outstanding loans amounted at the close of the year under review to £2,560,582.

The most generally interesting particulars, however, are those which deal with the accounts of borough councils acting as urban sanitary authorities, under the Burial Acts, as harbour, pier, or dock, &c., authorities, and as port sanitary authorities. The financial transactions coming within this section are of much greater magnitude than those which are embraced under the heading already referred to; and gas, water, and electric lighting works are included. The report remarks that in estimating the effect of the transactions recorded on the local taxation of the year, "it should be borne in mind that, though a considerable portion of the expenditure was defrayed out of the public rates for the purposes of public health and sanitary improvements, a large portion was to a greater or less extent reproductive, having been incurred in respect of undertakings which in some instances were wholly or partly self-supporting, and in others, besides paying their expenses, operated towards a reduction of the rates. The most important of these undertakings are water-works, gas-works, electric lighting, and harbours, piers, docks, &c." The receipts (excluding the loans) of the borough councils, acting otherwise than as municipal authorities, amounted to £27,392,851. Of this, £10,959,028 was received from rates, £6,221,602 from gas-works, £3,623,164 from water-works, and £1,978,234 from electric lighting undertakings—excluding charges for gas, water, or electric current supplied for trade purposes, and sums transferred from other accounts to meet deficiencies in revenue. The expenditure in the accounts under review (excluding that defrayed out of loans) was £27,401,086. Some of the items which went to make up this large amount were: Gas-works, £5,693,004; water-works, £3,732,809; electric lighting (including loan charges, which cannot in this case be distinguished from other loan charges, but no other expenditure on account of public electric lighting), £1,890,213; sewerage and sewage disposal, £2,016,532; and public lighting (including expenditure on public electric lighting not represented by loan charges), £1,089,268. The charges that were met out of revenue on account of loans were as follows: Gas-works, £1,167,842; water-works, £2,417,617; and electric lighting, £1,179,617. In addition to the above, the following sums were paid as charges in respect of capital belonging to the councils acting as municipal authorities and utilized instead of borrowing: Water-works, £936; electric lighting, £1116.

The expenditure defrayed during the year 1904-5 out of money actually borrowed by the borough councils acting as urban sanitary authorities, &c., amounted to £10,669,807, of which £491,151 was for gas-works, £2,724,660 for water-works, £1,935,056 for electric lighting (including expenditure on public electric lighting), and £1,246,800 for sewerage and sewage disposal works. The total amount of the loans raised during the year was £12,096,137, of which £822,402 was for gas-works, £3,453,369 for water-works, £2,023,023 for electric lighting, and £1,398,227 for sewerage and sewage disposal works. The sum applied to the repayment of principal and the redemption of stock or annuities during the year by the borough councils in respect of the debt on account of loans raised by, or transferred to, them for the purposes of the Public Health Acts, &c., was £3,489,618. The loans of these councils, acting otherwise than as municipal authorities, which were outstanding at the end of the year amounted to £177,047,852. Of this, £19,753,565 was for gas-works, £57,553,666 for water-works, £18,794,239 for electric lighting (including public electric lighting), £19,517,457 for sewerage and sewage disposal works. Loans outstanding in respect of gas-works, water-works, electric lighting, markets, harbours, piers, docks, and private improvement works amounted to £107,618,596, without including any sums raised for these purposes which it was not found practicable to apportion between these and other works, and which therefore appear under the heading of "Other purposes." This represents a net increase of loan debt on the undertakings referred to of £5,779,780 for the year, including the debt of the new borough—East Ham. The sums remaining in sinking funds, loan funds, and redemption funds at the end of the year 1904-5, to provide for the repayment of such portion of the outstanding loan debt as is repayable in this way, amounted to £10,494,834.

According to the 1901 census, the population of the 71 county boroughs was 9,570,523, and that of the 253 other boroughs 4,223,320; making an aggregate of 13,793,843. The total rateable value of land and other property was £69,386,320. The average borough rate of the county boroughs was 2s. 7·7d. in the pound, and of other boroughs 1s. 4·8d.; while the average general district rate of the county boroughs was 3s. 2·1d. in the pound, and of the other boroughs 3s. 2·6d.

Another table in the Blue-Book deals with the results of municipal trading, inasmuch as it gives such particulars as were furnished in the returns received by the Local Government Board relative to (1) transfers made by borough councils during the year from the accounts of their tramway, light railway, water, gas, electric lighting, harbour, and certain other undertakings in aid of rates; and (2) the transfers made by such councils from borough, district, or other funds to meet deficiencies in the revenues of undertakings of the same class. The transfers in aid of the rates were: From tramways and light railways, £209,444; water-works, £104,633; gas-works, £488,590; electric lighting works, £64,704; other undertakings, £31,371. The transfers to make up deficiencies in revenue were: From tramways and light railways, £36,383; water-works, £153,998; gas-works, £2380; electric lighting works, £38,617; other undertakings, £11,094. The total amount transferred by the boroughs in aid of the rates was £898,742; while the amounts transferred from rates to make up deficiencies in revenue came to £242,472.

Of the gas-works profits thus transferred in aid of rates, the amounts over £10,000 were: Birmingham, £50,677; Blackpool, £15,762; Bolton, £22,068; Burnley, £11,078; Leeds, £15,977; Leicester, £47,008; Manchester, £60,000; Nottingham, £28,300; Rochdale, £24,826; Salford, £23,630; Stockport, £12,449; Warrington, £10,330; Wigan, £13,000; and Southport, £11,250. Of the electric light works, Liverpool (£16,934) was the only instance in which a profit of over £10,000 was realized. Among water-works, also, there was only one case in which this amount was exceeded—Leeds, with a profit of £11,683, though Bolton was very near the line with £9800. Turning to the less fortunate instances in which sums had to be transferred to make up deficiencies in revenue, gas-works only figure twice—Morecambe (£1699) and Sandwich £681); but in the case of Wenlock, it is stated that the gas and water loan repayments were charged direct to the district fund. On the other hand, the list includes thirty-eight electric lighting undertakings, though in only twelve cases is the amount over £1000. In regard to losses on water-works, Birmingham, owing, of course, to its peculiar circumstances, easily leads the list with £45,000; but Huddersfield figures at £12,422, Cardiff at £12,795, and Swansea at £15,794.

As already mentioned, the accounts of the urban district councils will be noticed in another article.

Sulphate of Ammonia for Lawn Dressing.

A correspondent sends us the following recipe, taken from "Gardening Illustrated," for a useful composition for dressing lawns. It was given by the owner of the finest lawns in Leicestershire: "Sulphate of ammonia, one part; common salt, three parts; fine sand, six parts—to be scattered lightly on the grass from time to time. This application of common salt commends itself to me, as some of the finest grass I have seen is on lands which are covered by spring tides. I have used salt with advantage on my own lawns, but I have never seen it recommended before; and one of the largest sellers of lawn seed almost scoffed at the suggestion. This lawn dressing is not put forward as a weed killer, but just as a dressing to produce the finest and best turf for lawns." The correspondent who sent the preceding extract said a lady who uses the recipe speaks very highly of it; and she showed him one of her lawns which was in remarkably good condition. He was told that it was most important that the dressing should be applied in showery weather.

At the last monthly meeting of the Morecambe Town Council, the Mayor (Mr. S. Wright) took the opportunity of wishing Mr. J. R. Duff, who, as already announced in the "JOURNAL," has relinquished the position of Gas Engineer to go to Banbury, every success in his new appointment. Mr. Duff expressed his thanks to the Mayor and the members of the Council for their kindness. The seal was then affixed to the document appointing as Mr. Duff's successor Mr. H. Blakey, of York, who has agreed to remain at least two years at Morecambe. Before going to York, Mr. Blakey was with Mr. A. J. Hope, at the Nelson Gas-Works.

EXPERIENCES WITH GAS-ENGINE BREAKDOWNS.

A NEVER-FAILING source of interest is the annual report of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.); for in it we get a year's experiences of, among other things, gas-engine breakdowns and their causes, known or suspected. The incidents and experiences Mr. Longridge collects are contributed in a manner not pleasant to the owners of the machinery; but they are not the less informative and helpful. The misfortunes of the owners are of future benefit not only to themselves, but to others; and in this is their reward for their sufferings and inconvenience.

As in 1905, the rate of breakdowns among steam-engines in 1906 was unusually high—viz., 1 in 8·1 of the engines insured. Among gas and oil engines, the rate was lower—viz., 1 in 12·4. For this difference, there are several good reasons, the principal of which are: (1) Gas-engines have fewer parts than steam-engines; (2) these parts are on the average much smaller than the parts of steam-engines of the class which are insured; (3) gas-engines cannot be habitually subjected to stresses much heavier than the parts were designed to bear.

The proportions in which the various parts of the insured gas-engines that broke down in 1906 caused or initiated the breakdowns, are given in the last columns of the following table. The other columns give the percentages for 1905 and 23 years before.

GAS AND OIL ENGINES.

Description of Parts which are Believed to have Given Way First.	Average previous to 1905.	During	
		1905.	1906.
	Per cent.	Per cent.	Per cent.
Valves and valve gear	32·6	30·1	28·7
Cylinders and cylinder ends	16·6	15·9	16·7
Pistons	11·9	6·2	6·5
Connecting rods and their bolts	11·2	10·6	12·0
Main shafts	4·5	15·9	15·7
Governors and governor gear	4·4	5·3	7·4
Silencing-boxes and exhaust-pipes	4·3	5·3	2·8
Fly-wheels and driving-drums	4·3	3·5	4·6
Clutches and couplings	3·7	0·0	0·0
Frames and pedestals	2·8	2·7	0·0
Bolts*	2·7	0·9	0·9
Total—wrecks, cause not ascertained	1·0	0·0	1·9
Main driving ropes or belts	0·0	0·9	1·9
Starting gear	0·0	1·8	0·0
Gas-producer plants	0·0	0·9	0·9
	100·0	100·0	100·0

* These do not include bolts on pistons, connecting rods, valve gear, and other moving parts; the bolts in these parts being included with the parts themselves.

The causes of these breakdowns may be roughly classified as under:—

	Gas and Oil Engines. Per Cent.
Accident or causes unascertained	34
Old defects or deterioration by wear and tear	23
Weakness, bad design, workmanship, or material	24
Negligence of owners or attendants	19
	100

Some of the breakdowns enumerated above are described by Mr. Longridge; and, in making his selection, it is apparent that he has, as far as possible, proceeded on the lines of placing on record all unusual occurrences or types of constantly-recurring sequences of cause and effect. The very first example is a somewhat peculiar one. Here we have a horizontal gas-engine, with cylinder 6½ inches diameter by 13-inch stroke, running at 165 revolutions per minute, with town gas. The water for cooling the jacket was supplied from tanks through a pipe provided with a stop-cock, and returned to the tanks through another pipe, entering one of them near the water-level. The tanks were placed where they could receive rain water from the roof of the works. Intending to be absent for two days during the frosty weather in December, the owner drained the jacket, locked up the place, and left the engine, as he thought, safe. After his departure, a heavy shower came on, which filled the tank above the mouth of the return-pipe from the jacket, and so filled the latter with water. After the shower came a frost, which froze the water and forced a piece out of the jacket about 6½ in. by 5 in. which the owner found when he returned to re-open his works. The drainage of water-jackets in cold weather is very necessary. Every frost brings in a number of claims for broken cylinders, although the Company sends out many circulars at the beginning of every winter warning insurers either to keep their gas-engines warm at night and week-ends or to empty the water-jackets and connected pipes. Another notable occurrence, was in the case of a horizontal gas-engine, with cylinder 17 inches diameter by 24-inch stroke, running at 160 revolutions per minute, with Dowson gas. The power, varying from 30 to 70 indicated horse power, was transmitted by a belt running on a pulley 6 feet diameter, keyed on the over-hanging end of the crank-shaft outside one of the two fly-wheels. The pulley was made in halves, with a cast-iron boss, having a flange 15 inches diameter and 2 inches thick on each side, and had 44 wrought-iron or steel arms 1 inch diameter screwed 22 into each flange, and a wrought-iron rim 2 feet wide and $\frac{5}{16}$ inch thick. The engine was put to work in 1904, and usually ran from 6 a.m. to 5 p.m. daily. One morning about 8.15 a.m., when driving the shafting only, the belt-drum suddenly collapsed. Forty of the arms snapped off close to or just inside the boss, and the other four were bent. Three of the broken arms appeared to have been broken for some time; but the fractured surfaces in the rest were fresh. No cause could be assigned; but the inspector who examined the wreck stated that the arms were very brittle, and suggested that the brittleness might be due to long-continued vibration set up by the impulses communicated to the drum by each explosion in the cylinder. That this would have the effect of breaking the arms through the screw-threads in the boss, is probable enough; but it is curious that this effect should have been produced practically simultaneously in 37 out of the 44 arms.

The breakages of crank-shafts in 1906 were fewer than in 1905, although the number of gas-engines insured was greater. The decrease is no doubt due to the larger diameters which many makers of gas-engines have adopted during the last two or three years. If all would follow this good example, the breakages would be fewer still. Shafts which might have been strong enough five years ago are insufficient for the higher compressions and heavier fly-wheels now in use; while shafts which were too weak for the old conditions are still more inadequate to-day. Calculations of the stresses upon the shafts of gas-engines are so difficult and uncertain as to be practically impossible, and makers have to rely to a very large extent on experience, which can only be gained slowly and at considerable expense.

The practice seems to be to make the shafts, and particularly the crank-pins, of small engines relatively stronger than those of large. But the general tendency is to increase shaft diameters. Nevertheless, weak shafts are still being made. In the keen competition for business the makers of these shafts gain an unfair advantage; for the buyer of a gas-engine, particularly a small one, has seldom the faintest idea whether the shaft supplied to him is strong or weak. Of the shafts that broke in 1906, 77 per cent. had two bearings, 23 per cent. had three or more bearings. Of the shafts with two bearings, 53 per cent. had one fly-wheel, and 47 per cent. had two fly-wheels. Of the shafts with two fly-wheels, one broke in one of the crank-arms, and one in the body close to the skew-wheel for driving the side shaft. The rest broke in one of the necks, usually the neck at the end that carried the driving-pulley. Of the shafts with one fly-wheel, two broke in the crank-pin; the rest in the neck between the crank and the fly-wheel. The shafts with three bearings all broke in the neck between the crank and the fly-wheel. The breakage of the shaft of the two fly-wheel engine close to the skew-wheel was unusual. The engine was six years old. It had a cylinder 6¼ inches diameter by 12-inch stroke, and ran at 160 revolutions per minute with town gas. The shaft was steel, 2¼ inches diameter, with two bearings, each 6 inches long. The skew-wheel was fixed close to the end of the left-hand bearing, and just beyond it was one of the fly-wheels. The other fly-wheel and driving-pulley were at the other end of the shaft. The left-hand end of the shaft, with its fly-wheel, dropped off and careered across the engine-room, and the skew-gear was broken. The fracture occurred close to the edge of the skew-wheel and between it and the fly-wheel. It was at right angles to the axis of the shaft, and partly old. Apparently it had started with a skin crack produced by a scriber or by pressure of the sharp edge of the skew-wheel, and had then extended across the shaft.

A case that may be described as unusual is a horizontal gas-engine, with cylinder 11⅜ inches diameter by 20-inch stroke, running at 180 revolutions per minute with suction gas. Soon after starting one morning, the attendant noticed the cap of one of the main bearings wriggling and one of the fly-wheels wobbling. He came to the conclusion that the shaft was bent, and sent for the makers, who took it to their works, straightened it, re-turned it, and replaced it in its bearings. On starting the engine, the shaft was again found to be bent, and was sent back to the maker's works the second time. Here one of the Company's inspectors examined it. He found it bent about ⅛ inch, and noticed a mark like a fine crack at the junction of the right-hand neck with the crank. A few blows with a hammer convinced him that the shaft was cracked. He therefore had it taken out of the lathe, and broken with a sledge hammer. The cause of the bending then became apparent—viz., a crack extending through a large proportion of the cross-section of the shaft. The cause of the crack also became clear—a sharp corner at the junction of the neck with the crank web. This sharp corner had probably been cut by the turner by mistake; and somebody, to cover it up and avoid scrapping the shaft, had shrunk on a collar, and turned it to form a fillet. The shaft would have been weak even with a proper fillet; but its weakness was, of course, increased by the abrupt change of section covered by the false fillet. Its short life of about 32 million revolutions is thus accounted for.

In some other cases particulars believed to be fairly accurate of the lives of shafts were obtained. They are given next page. As regards these figures, it is right to observe generally, that the numbers of explosions per minute are only the averages of the numbers counted by the inspectors at their periodical visits, and are therefore only approximately correct; and, particularly, as regards No. 2 that the fillets at the ends of the necks were very

—	Diameter of Cylinder.	Stroke of Piston.	Revolutions per Minute.	Explosions per Minute, Average.	Number of Bearings.	Number of Fly-wheels.	Life of shaft in Millions of Revolutions.
1	8¾	15	182	63	2	1	31
2	12	20	172	48	2	2	150
3	20	30	180	49	3	1	83
4	15½	23	184	—	3	1	15
5	8¾	15	190	41	2	1	92
6	16½	20	160	31	2	2	104
7	7¾	14	200	74	2	2	348
8	10	20	180	49	2	2	135
9	16	21	162	—	3	1	259
10	5	9	230	48	2	1	149
11	10	18	205	46	2	2	235
12	13½	20	175	32	2	2	181

small, No. 9 that the foundation was very unsteady and the bearings probably out of line and level, and No. 10 that this was the third shaft broken. A fourth gave way in March this year, after making 45 million revolutions. All broke in the crank-pin, which is not astonishing considering its weakness. The breakage of No. 3 after so short a life as 83 million revolutions is difficult to account for, except on the assumption that the third bearing had got out of line or level, and thus caused excessive stress on the neck which broke.

(To be continued.)

GAS-WORKS ACCIDENT FUNDS.

South Metropolitan and South Suburban Schemes.

When noticing in the "Journal" for Dec. 25 last the lates issued report of Mr. J. D. Stuart Sim, the Chief Registrar of Friendly Societies, with regard to mutual schemes between employers and employed for securing to the latter the benefits (or more than the benefits) provided by the Workmen's Compensation Act, it was pointed out that only two Gas Companies were included among those concerns that had in this way "contracted out" of the Act. These were the South Metropolitan and South Suburban Gas Companies; and in the belief that they will prove of interest to others engaged in the gas industry, we now publish the rules as revised to comply with the new Compensation Act. These, it may be mentioned, have, as required, been certified by the Registrar of Friendly Societies, to remain in operation (if not further renewed) until June 30, 1913. There are also included the rules of the "Jury" system of inquiry into accidents, which have been somewhat altered and improved. This system has been a great success with the two Companies.

Writing on the subject, Sir George Livesey says: "In order to make it quite certain to all the workmen that their subscription could not relieve the Companies of any portion of their responsibility under the Act, it was made almost nominal. But a novelty has been introduced in Rule VII. whereby the subscription is graduated according to the number of accidents. This is just, and will, I hope, tend to reduce the number of accidents. I can explain the justice in this way. Suppose 1000 men pay 1s. a year apiece (= £50); and suppose there are 50 accidents costing an average of about £8 each, or £400. The workmen's subscription is only 12½ per cent. of the total cost; and as the benefits obtained under the scheme are quite 25 per cent. greater on the whole than those given by the Act, the workmen's subscription clearly is not a relief to the Companies. But, to put an extreme case, suppose there are only five accidents in the year costing £40, then the workmen's subscription more than pays the total cost. The proviso in Rule VII. meets the difficulty. If the accidents are at the rate of 55 or more per 1000 men, the subscription will be 1d. a month; if accidents are at the rate of 40 and under 55, the subscription will be 1d. for two months; and if under 40, 1d. a quarter. Each station of the South Metropolitan Gas Company will be treated separately; and every half year a notice will be put up, giving the particulars of all the stations and the rate of subscription for the next half year. This time two are 1d. a month, two 1d. two months, and three 1d. a quarter. But it will be said, Why trouble about a subscription at all, seeing it is so small? The answer is that we are a co-partnership, and we want to enlist, in all our dealings with the men, their co-operation, and especially in the prevention of accidents. Moreover, their subscription, however small, brings them in a sharing in the responsibility and in the management of the fund. The Company have gained in four ways—(1) the promotion of goodwill, (2) the reduction in the number of accidents, (3) a money saving, and (4) the prevention of litigation. The cost has been brought down to about 5s. per cent. on wages, with considerably more liberal payments than the Act required. Under the new Act, it will be increased to not more than 7s. per cent. to the Company."

The rules of the two Companies are practically the same; and we give those of the South Metropolitan Company, on the first page of which appears the following statement, signed by Sir George Livesey: Prevention is the chief object. "Prevention is better than cure." How poor a substitute for prevention is money compensation. The Directors hope, with the hearty co-operation of all officers and workmen, to reduce accidents to the smallest possible number. All are requested to exercise all possible care and forethought, and to report, without loss of time, any defects in plant or appliances to the foreman in charge of the work or to the engineer of the station. The Directors thankfully acknowledge this co-operation in the past; for since this scheme was started in 1897, the proportion of accidents per 1000 subscribers to the fund has been greatly reduced, as is proved by the following figures:—

1898—82 per 1000	1901—64 per 1000	1904—50 per 1000
1899—76 do.	1902—52 do.	1905—44 do.
1900—71 do.	1903—56 do.	1906—37 do.

Note.—These figures include all accidents that incapacitated for three days. Rather over half the accidents are slight, incapacitating for less than a fortnight.

The benefits of the fund beyond those of the Workmen's Compensation Act are: (1) Free medical and surgical attention. (2) The accident pay averages 1s. 6d. a week more. (3) The Act gives nothing for the first week for accidents disabling for less than a fortnight; the fund gives 18s. from the date of the accident in all cases. (4) The allowance to widows on the average exceeds the provisions of the Act. The workmen's subscriptions only partially meet these extra benefits.

SOUTH METROPOLITAN ACCIDENT FUND.

When an accident happens, everything, as far as possible, is to be left untouched. The foreman is at once to be informed; and, if a serious accident, also the engineer of the station.

Rules.

I.—*Name.*

This fund shall be called the "South Metropolitan Gas Company's Accident Fund."

II.—*Object.*

First, the prevention of accidents. Secondly, this fund is established by mutual agreement between the Company and their workmen as a substitute for the Employers' Liability Act, 1880, and the Workmen's Compensation Act, 1906. To give prompt and certain compensation to workmen for loss by reason of accidents, incapacitating for not less than three days, occurring to them in the course of their employment in the service of the Company. They will be admitted to the benefits of this fund, subject to the conditions specified in the following rules. This fund relieves the Sick Fund from all charges for accidents.

III.—*Membership.*

All men in receipt of weekly wages employed by the Company, including all odd or casual men, are invited to contribute to the fund, and accept the benefits which it provides in case of accident, in lieu of any claim which they, or their representatives, might otherwise have had against the Company under the Acts named. The payment of the subscription shall constitute acceptance of the conditions, and shall entitle to the benefits of the fund, and shall be deemed a contract within the provisions of section 3, sub-section 1, of the Workmen's Compensation Act, 1906.

IV.—*Withdrawal from Fund.*

Any member wishing to withdraw from the fund may at any time (except after an accident, and during the time he is entitled to accident pay) give a month's notice, and at the expiration of the month shall cease to be a member.

V.—*Committee of Administration.*

The fund shall be administered by the Co-Partnership Committee.* The Honorary Secretary of the Co-Partnership Committee shall act as Secretary to the fund.

VI.—*Auditors.*

The Co-Partnership Auditors shall audit the accounts, which shall be kept by the Company's officers at the Company's expense; and all money shall be in charge of the Company.

VII.—*Income—How Raised.*

Workmen's Contributions.—To encourage the desire to prevent accidents, the contributions of the workmen shall vary according to the number of accidents. For this purpose, each station shall be treated separately; the contribution for the half year at each station varying according to the number of accidents at the station in the preceding half year. When the accidents in any half year at any station are at the rate per annum of 55 or more per 1000 men employed, every man at that station in receipt of weekly wages (including men casually employed) who joins the fund, shall pay in advance 1d. a month for the next half year. When the accidents are at the rate of 40 and under 55 per 1000 men per annum, the subscription shall be at the rate of 1d. for two months. When the accidents fall below the rate of 40 per 1000 men, the subscription shall be at the rate of 1d. a quarter. Youths under 18 years of age and women shall pay half the above subscription, and receive half the benefits of ordinary members. These contributions will be entirely devoted towards the payment of free medical and surgical attendance.

Company's Guarantee.—The Company guarantee the financial stability of the fund, and will subscribe the necessary amount quarterly to make income balance expenditure, and further guarantee at the expiration of the scheme a due provision for the allowances payable to the then existing incumbents.

VIII.—*Benefits.*

The benefits to members must, on the whole, exceed those obtainable by the Act to the extent of their contributions to the fund.

* The Co-Partnership Committee consists of 36 members, of whom 18 are workmen elected by ballot and 18 other members elected by the Board of Directors, of whom one is the Chairman, who is also Chairman of the Co-Partnership Committee.

Members.—Non-Fatal Accidents.—The allowances, with free medical attendance, shall be at the following rates:—

(*a.*) Accidents disabling for not less than three days shall entitle members to benefit at the rate of 18s. a week from the date of the accident. Payment to be continued until recovery, or until the doctor certifies that the man is fit for work, or until he is proved to be permanently incapacitated. In all cases, on recovery, if able, injured men will return to their usual work at the same wages; but if partially disabled, other work will be found for them at not less than 24s. a week, if the wages exceeded that amount.

(*b.*) If it is proved that the injury to a workman is attributable to the serious and wilful misconduct of that workman, any compensation claimed in respect of that injury shall, unless the injury results in death or serious and permanent disablement, be disallowed. To men injured by their own "serious and wilful misconduct" the Company give no undertaking as to future employment.

Non-Members.—Those workmen, whether regular or odd men, who do not subscribe to the fund will, in consideration of the Company's contribution thereto, be paid from the fund what they may be entitled to under the Workman's Compensation Act, 1906, without medical attendance, and with no undertaking by the Company to find employment on recovery.

IX.—*Permanent Disablement.*

In cases of permanent incapacity to do any work, the Co-Partnership Committee shall decide what permanent weekly allowance or lump sum shall be paid in addition to any pension from the Superannuation Fund to which the injured man may be entitled; but the total shall not be less than he could have obtained under the Act of 1906.

X.—*Fatal Accidents.*

In the case of a fatal accident, £12 funeral money shall be paid to the widow or dependants from the Accident Fund. The widow shall be granted a pension while leading a respectable life, or until re-marriage, when a sum not exceeding £10 shall be paid her. Such pension to be in all cases £1 a week for at least the first three months. At any time after the three months, the pension may be reduced gradually, or at once, as the Co-Partnership Committee may determine, to the following scale:—

Widows without children, 10s. a week.
For each child not exceeding five in number, under 14 years of age, 2s. a week.
The total payment not to exceed 20s. a week.

If the deceased man was a widower leaving children dependent, or if he leaves other dependants wholly, or in part, dependent upon his earnings, the Co-Partnership Committee shall decide what allowance shall be made, which shall be in excess of the amount obtainable under the Act, but shall in no case exceed what would have been given had there been a widow with children. If he leaves no dependants, the reasonable expenses of his medical attendance and burial, not exceeding £10, shall be paid from the fund.

NOTE.—In 1907, the wages paid averaged 33s. 1d. per week for all wage-earners in constant employment (30s. 6d. in the case of the South Suburban Company).

XI.—*Three Days' Disablement.*

No claim shall be made on the fund for less than three working days' disablement.

XII.—*Notice of Accident.*

Every workman intending to claim on the fund must give notice, personally or in writing, to the engineer of the station as soon as possible, or at the outside within three days after the occurrence of the accident. In case of further delay, the Committee shall have the option of dating the payment of allowance from such time as they consider fair.

XIII.—*Medical Examination.*

The certificate of any qualified medical man that the claimant is unable to work by reason of some injury, will, when accompanied by a form of application, be accepted by the Committee. But immediately any claim is formally made, the claimant must undergo examination by the doctor appointed by the Committee on receipt of an order from the authorized officer at the station. Anyone refusing to comply with such order shall have his allowance stopped pending the consideration of the case by the Committee. In cases of doubt or uncertainty, a consultation with another of the Company's doctors shall take place.

XIV.—*Behaviour while in Receipt of Weekly Allowance.*

Every person in receipt of weekly allowance must be under qualified medical attendance during the whole of the time he is receiving such allowance; and if his medical attendant or fund doctor, or the visitor, or any member of the fund shall report to the authorized officer at the station neglect of ordinary precautions—such as being out of doors after 7 p.m. in the winter and 9 p.m. in the summer, use of intoxicants against doctor's orders, or if the injured person do anything to retard his recovery, or fail to go to work when able to do so, the further payment of allowance, either wholly or partially, shall be stopped, subject to appeal by the injured workman to the Co-Partnership Committee.

XV.—*Persons leaving Home.*

Any person receiving a weekly allowance who may desire to leave home for change of air, &c., must inform the authorized officer at the station of his intention of doing so. Such officer shall then cause him to be examined by the fund doctor, who will decide whether such change is desirable or not.

XVI.—*Weekly Medical Certificate.*

Injured persons receiving weekly allowance, who are living at a distance beyond the supervision of the examining doctor, must supply the authorized officer at the station, not later than Thursday of each week, with a medical certificate of their inability to work.

XVII.—*Allowance—To whom Paid in Case of Death.*

No allowance will be paid until clear legal proof has been supplied to the Co-Partnership Committee that the claimant is the widow, or children, or dependant of the deceased.

XVIII—*Conditions under which Accident Allowance will be Paid.*

Before any allowance can be granted for any accident, it must be proved that it occurred while the workman was in the employ, and actually engaged in, the work or business of the Company. In case of death, or permanent disablement, the Co-Partnership Committee shall decide what allowance shall be made, in accordance with the rules.

XIX.—*Declaring off Fund.*

Every person resuming work, after being in receipt of weekly allowance, must report the same, at once, to the Secretary or authorized officer at the station.

XX.—*Annual Balance-Sheet.*

A balance-sheet and statement of accounts, with the number of accidents in the past year, shall be prepared every February, and posted in prominent positions at the works; and when desirable a meeting of the workmen will be held for the consideration of the same.

XXI.—*Extras.*

When the Co-Partnership Committee shall consider that the interests of an injured man will be thereby served, they shall have power to grant extras—such as a sum of money to enable him to go into the country, or to a convalescent home, or for a surgical appliance.

XXII.—*Juries of Workmen.*

The system of an inquiry into accidents by a jury of twelve workmen, shall be continued in accordance with the following regulations:—

1.—An inquiry shall be made within the first fortnight, if possible, into every accident that is a charge on the fund.

2.—At the discretion of the engineer, an inquiry may be made into any accident that is not a charge on the fund or that results in loss of, or damage to, property only.

3.—That such inquiries be made by a jury consisting of twelve workmen presided over by the engineer of the station, except in fatal cases, when the Chairman, or one of the Directors of the Company, shall preside; and in these cases the inquiry shall be subsequent to the Coroner's inquest.

4.—In order to secure a fair selection of jurymen, an alphabetical list shall be made in the month of May every year at each station of all the men who have been three years in the Company's service; and in selecting a jury, the names shall be taken in the order in which they appear on the list. Every jury shall consist of not more than two members of the Co-Partnership Committee of the station, not more than four from the department in which the accident happened, and the remainder taken in order from the jury list—men required as witnesses are not to serve on the jury. Any man, excepting the members of the Co-Partnership Committee, having served on a jury, shall not again serve until the whole of the names on the list have been called in their turn.

5.—The jury and the presiding officer shall call witnesses and hear evidence, and thoroughly investigate all the conditions and circumstances connected with the accident. The jury shall then retire alone to consider, and endeavour to agree upon, a verdict.

6.—To prevent a similar accident, the jury shall endeavour, to the best of their ability, to arrive at the real cause of the accident, and, when they have done so, shall state their honest conviction, not hesitating to say whether any blame attaches to any official or workman, or whether the plant, machinery, or means of protection were defective, if they are satisfied that there has been any neglect, or carelessness, or defect.

7.—The jury shall determine whether it was a pure accident, or who or what was the cause, or whether it was due to serious and wilful misconduct. These points whenever there is any doubt, shall be decided by ballot, and by a two-thirds majority; the twelve jurymen alone voting. On these points, either the injured workman or the engineer of the station is to have a right of appeal to the Chairman of the Company, whose decision shall be final.

8.—If, in the opinion of the jury, anything can be done to prevent a similar accident in future, they shall make such recommendation as they may consider necessary.

9.—The inquiry shall take place in public—that is in the presence of as many of the workmen as can conveniently attend without unduly interfering with their work; and, where practicable, the inquiry shall be held on the spot where the accident happened.

10.—The verdict of the jury shall be posted up in one or more conspicuous places about the works; and particulars, with a summary of the case and the proceedings thereon, with the verdict, and the names of the jurymen, shall be recorded in a book kept for the purpose. A copy of this summary shall also be sent to the Secretary of the Company, to be laid before the Directors.

Note.—The followiug questions are submitted as a guide to the jury, to which they may add any remarks they may consider necessary.

Questions.

1.—Was the accident caused by any defect in the plant or materials used; and, if so, say what it was?

2.—Was there any mistake in the manner in which the work was done; and, if so, state it?

3.—Was the accident due to the negligence or want of care or foresight of any officer or foreman; and, if so, let the truth be known?

4.—Was the accident caused wholly or in part by any carelessness or negligence of the injured man, or by that of any of his fellow workmen; and, if so, let the truth be known?

5.—Was the accident attributable to the serious and wilful misconduct of the injured man or any other person?

6.—Was it a pure accident, for which no defect in plant and no one was to blame?

7.—Can anything be done to prevent a similar accident?

The prevention of accidents is the chief object. Therefore to give honest and true answers is a duty; and it will do a kindness to all concerned, and will not penalize anyone except on Question 5. Men injured by "their own serious and wilful misconduct" get no compensation except in case of death.

XXIII.—*Notice to Close Fund.*

Six months' notice from the Company or workmen shall terminate the existence of this fund.

XXIV.—*Alteration of Rules.*

Notice of any proposed increase or decrease in the amount of contributions, or an alteration of the scale of allowances, or any alteration or addition to these rules, shall be posted at all the works of the Company for fourteen days, and meetings of workmen will be held for an expression of opinion upon the same. If approved by a two-thirds majority, the alterations or additions shall be incorporated in the rules, subject to the consent of the Registrar of Friendly Societies; but no alteration shall be made which would render the scheme less favourable to the workmen than the provisions of the Act.

XXV.—*Ambiguous Rules.*

In all cases when the meaning of a rule is disputed, the decision of the Co-Partnership Committee shall be final, and without appeal.

COMPARATIVE COST OF GAS AND ELECTRICITY.

By J. DUNCAN, M.A., LL.B., Barrister-at-Law.

THE competition of electric lighting companies with gas companies for the patronage of their consumers is becoming so keen that undue preferences are offered in some instances, contrary to section 20 of the Electric Lighting Act, 1882. A difficulty in detecting these preferences stands in the way in some cases by reason of the ingenious forms in which the abatements are offered. For example, a company will have as their printed price for lighting 7d. and 3d., or a flat-rate of 6d., while gas consumers are offered all sorts of prices, such as "15 per cent. less than your gas bill." It is not clear, on the face of this offer, whether or not this is an undue preference given to gas consumers over those who do not burn gas. The section reads—

The undertakers shall not, in making any agreements for a supply of electricity, show any undue preference to any local authority, company, or person; but, save as aforesaid, they may make such charges for the supply of electricity as may be agreed upon, not exceeding the limits of price imposed by or, in pursuance of, the Licence, Order, or Special Act authorizing them to supply electricity.

In order to afford a basis of comparison, it is necessary to reduce the prices of gas and electricity to a common denominator—say the cost per hour or, better, the cost per ten hours. For example, the cost of 16-candle power gas at 3s. per 1000 cubic feet and electricity at 6d. per unit can be compared by ascertaining the time that a unit of either illuminant will last. The comparison can be extended to other prices, and the whole arranged in the form of a table. In the same way, other tables can be elaborated for 15 and 14 candle power gas; the compilation forming a ready reckoner for gas managers who have to withstand the illegitimate competition of electric companies.

The following calculations are based on the estimate that 5 cubic feet of gas per hour are required to produce a light of 16-candle power, and that the Board of Trade unit of electrical energy—viz., 1000 watt-hours—will give 16-candle power of electric light for 17½ hours.

Gas. Price per 1000 Cubic Feet.	Cost per Ten Hours.	*Electricity.* Price per 1000 Watt-Hours.	Cost per Ten Hours.
1s. 0d.	0·6d.	1d.	0·571d.
2 0	1·2	2	1·142
2 6	1·5	3	1·715
3 0	1·8	4	2·285
3 6	2·1	5	2·855
4 0	2·4	6	3·430
5 0	3·0	7	4·000
6 0	3·6	8	4·570
7 0	4·2	9	5·140
		10	5·710
		11	6·300
		12	6·860

Thus it will be observed that at the prices of 3s. for gas and 6d. for electricity there is a saving of 1·63d., or about 1½d., per ten hours. Assuming an average use of light for four hours a day, there would be a saving of 18s. 3d. per year for each light, or £3 13s. for four burners—a fair estimate for a tradesman's household. If worked out to decimals, the saving would have been £3 19s. 7d. This can be shown by a comparison of the total bills for the year in the above example. The electric bill would be for 334 units, or £8 7s.; the gas bill for 29,200 cubic feet, or £4 7s. 5d.—showing a difference of £3 19s. 7d. A 15 per cent. discount offered in the case cited would represent a further 13s., or £4 12s. 7d. for each similar household paying the printed flat-rate of 6d. In a town of 10,000 consumers, the undue preferences would represent upwards of £45,000, which the sole users of electricity would be entitled to get back every year from the electric company. This amount is, perhaps, not wonderful, seeing that a well-known Oil Company in America has lately been fined £6,000,000 for allowing illegal rebates, which are of the same nature as undue preferences.

The foregoing table is calculated upon the yield of the old flat-flame burner. A comparison with the incandescent mantle, of course, shows still greater economy in favour of gas lighting. By substituting the incandescent mantle for the flat-flame burner, the cost of the gas will be reduced to ⅛th (strictly 1·7·8th), and in extreme instances to $\frac{1}{55}$th in the case of the best, and $\frac{1}{15}$th in the case of the worst, flat-flame burners. The data upon which these calculations are based are to be found in one of the Cantor Lectures delivered by Professor Lewes at the Society of Arts towards the close of 1902, and published in the "JOURNAL" at the time. The following are the figures given by Professor Lewes as showing in candle-units the light emitted per cubic foot of 16-candle gas consumed:—

Burner.	Candle-Units.
(1) Incandescent, high pressure	30 to 35
(2) ,, Kern	20 ,, 25
(3) ,, ordinary	14 ,, 19
(4) Regenerative	7 ,, 10
(5) Standard argand	3·20
(6) Ordinary argand	2·90
(7) Flat-flame, No. 7	2·44
(8) ,, No. 6	2·15
(9) ,, No. 5	1·87
(10) ,, No. 4	1·74
(11) ,, No. 3	1·63
(12) ,, No. 2	1·22
(13) ,, No. 1	0·85
(14) ,, No. 0	0·59

The ⅛th saving in cost is found by comparing the flat-flame burner No. 5 (9) with the ordinary incandescent burner (3). The extreme cases $\frac{1}{55}$th and $\frac{1}{15}$th are derived from comparing the flat-flame burners No. 7 (7) and No. 5 (9) with the incandescent high-pressure burner.

Applying these figures, another table can be constructed showing the comparative cost of electric light and gaslight supplied per incandescent mantle. But, in order to make the comparison intelligible, it is necessary to increase the standard of comparison beyond the ten hours in the previous table. I have taken a standard of 1460 hours a year, so as to maintain the same comparison as in the previous references of gas consumption for four hours a day:—

Gas. Price per 1000 Cubic Feet.	Cost for One Year of 1460 Hours, 4 Burners.	*Electricity.* Price per 1000 Watt-Hours.	Cost for One Year of 1460 Hours, 4 Lamps.
1s. 0d.	3s. 7d.	1d.	£1 7 10
2 0	7 3	2	2 15 8
2 6	9 1	3	4 3 6
3 0	10 10	4	5 11 4
3 6	12 9	5	6 19 2
4 0	14 7	6	8 7 0
5 0	18 2	7	9 14 10
6 0	21 8	8	11 2 8
7 0	25 6	9	12 10 6
		10	13 18 4
		11	15 6 2
		12	16 14 0

The undue preference now appears much more than in the comparison with the flat-flame burner. The comparative costs are now 10s. 10d. per annum for gas (at 3s.) and £8 7s. for electricity (at 6d.); being a saving of £7 16s. 2d. for the selected householder or £70,883 6s. 8d. for the suggested town of 40,000 inhabitants. Another 15 per cent. as allowance would increase the total by £1500. These undue preferences are sufficiently great to break up most of the infringing electric companies, and give a respite to genuine gas competition by the incandescent system.

The Ferro-Concrete System of Reservoir Construction.

Within the last few years, many reservoirs, of all sizes and kinds, have been constructed in Great Britain in accordance with the Mouchel-Hennebique system of ferro-concrete; and as an indication of the increasing employment of this system for the purpose named, we give the following brief particulars relative to works for which contracts have recently been settled. The most important of these is the covered service reservoir designed for the borough of Poole by Mr. W. Matthews, M.Inst.C.E., of Southampton, which will be 140 feet long and 40 feet wide, and have a capacity of 520,000 gallons. At Queenborough, a circular reservoir, 30 feet in diameter and 19 feet deep, with a capacity of 120,000 gallons, is under construction from the designs of Mr. H. Small, the Engineer to the Corporation. At Bramham Park, near Leeds, an octagonal storage reservoir 18 ft. 6 in. by 4 feet, is being built for Mr. G. Lane-Fox, M.P., from the designs of Messrs. Blow and Billery, Architects, with Mr. L. G. Mouchel as Consulting Engineer. Underground reservoirs at the collieries of the Harton Coal Company, near South Shields, a service reservoir roof at Spennymoor for the Weardale and Consett Water Company, a water-tower for the Pocklington Urban District Council, and a reservoir for the North British Railway Company at St. Margaret's, are among other works of the same class for which contracts have been signed.

NOVELTIES FOR THE HEATING AND LIGHTING SEASON.

IN THE GAS-HEATING SECTION.

THE whirligig of time has again brought us to the season of the year when works improvements and repairs ready for the winter's demand are finished or are approaching that state, and when the gas manager will be turning thoughts and attention to the installation in his show-rooms of some of the latest types of fires, lamps, and fittings that the manufacturers have turned out for acceptance by him and the public. The manufacturer of such appliances must ever be on the alert, and ever studying requirements, in order that he may be in the van in the matters of efficiency and suitability for varying position and purpose. Take the gas-fire for instance. Its extending popularity rests largely, it is true, on the price of gas, but, in a no inconsiderable degree too, upon heating efficiency relative to consumption, upon adaptability to position, and upon the conveniences provided for economically maintaining the fires in a good condition, without the trouble of disconnecting and removing them. With the price of gas the manufacturer of the fires has no concern other than that he knows it influences his trade; with the three latter points, he is doubly concerned, for in connection with them he has to please both the public and the very properly exacting gas manager. Thus we find, season after season, that, in one or other or in all three respects, the manufacturers give us something new appealing for consideration, and showing advance upon what has gone before.

To the aid of the gas-fire makers, other minds and outside investigation are being invoked; and if there are further means by which efficiency of service can be heightened, the gas-fire maker will be as pleased to take advantage of such means as the gas manager and the public will be to enter upon the enjoyment of them. Meantime, we are not among those who try to belittle what the gas-fire manufacturers have so far given to the industry. Their productions embody the best of which they are capable, until they find out, or someone shows them, the way to something better. The present productions are of good appearance and finish, and applicable to all conditions; and heating capacity and usefulness (though, from the scientific point of view, it is not claimed that finality has been reached) are so pronounced that to decry gas-fires in these respects is to speak into deaf ears. There is an excellent business already being done in gas-fires; otherwise it would not pay the makers to devote as much time and attention as they do to this class of business. But it is not what it might be. The public wants educating; and the gas industry cannot, and must not, allow somnolency to creep into this branch. It must be pushed; and there must be renewed interest. Now is the time for special activity. Coal is dear; and there is competition in every town from electricity at low prices to capture the business, and a new solid fuel competition is threatened. It is said that this new solid fuel competition is with coal and not with gas or coke. Let the gas manager not be misled into any comfortable indifference. To the extent that the new solid-fuel provided by fresh comers obtains patronage, to that extent the chances of gas heating must for a time be lessened. Moreover, a further inducement to greater animation in the heating branch is that in some towns the gas-cooker has spread itself with such rapidity that the numbers of cookers and gas consumers are fast nearing an equality. The field for special enterprise that offers in heating is, as was shown in our editorial columns a fortnight since, an extensive one. But to secure any large accretion of business from it, there must be a special and persistent attack; for, as Mr. Shadbolt put it in his interesting letter last week, every branch of the gas business really requires different treatment, and this one of heating more so than the others. This is a business that cannot develop or take care of itself without assistance. As in the early days of the gas-cooker, prejudice has to be broken down, and inducements offered. What man has done, that man may do. And the success that followed perseverance with the gas-cooker should, in considerable part, succeed a continuous special campaign in the heating field.

In many towns, there have in the past been objections, on the part of the gas management, to the hiring-out of gas-fires in the same way that cookers are hired-out. It has been a question for consumers of purchase of fires at cost price from the Company or Gas Department, or leave them. But that will not do now. The reasons advanced for this policy have been many; but they are all survivals of a totally different condition of things from the existing. The consumption of gas by fires was at one time high; efficiency comparatively low. Now the consumption has been reduced, by proper regulation, to something like half. The time was when a 10-inch fire would roar away, and cause the index of a meter to register with unerring regularity something like 40 cubic feet of gas an hour, until the consumer, through the excessive heating of the room, was reminded that the gas was being wasted. Nowadays 20 cubic feet an hour at 2-inch pressure will give as much satisfaction as 40 cubic feet in the olden days; and the 20 cubic feet can be largely reduced on the room attaining a comfortable degree of warmth. The greater consumption of bygone days led to complaint, and complaint ruffled the composure of the gas officials. Then another reason was that fires were formerly built in a manner that defied their maintenance in good condition without disconnection, removal from the consumer's premises, and their return and refixing. This involved a large amount of labour. But labour has now been brought down to an almost negligible quantity by the new methods of construction, which have made maintenance the very occasional work of but a few minutes per stove *in situ* without putting the consumer to any greater inconvenience than the presence of a workman for a time so short as to be measured by minutes, and the deprivation of the service of the fire for a similar short period. The interchangeability of parts, too, has made repair quite a light matter. Thus it is that condition has altered, and the reasons for not ardently prosecuting the heating business have been dispelled by ingenuity, and cannot now have any real existence.

Richmond Gas Stove and Meter Company, Limited.

The manufacturers of gas-fires have all, year by year, done their part in meeting the needs (referred to in the preceding paragraph) that time and experience have disclosed. What the gas manager wants to-day, says the Richmond Gas Stove and Meter Company, is that the gas-fire makers should provide him with as many facilities as possible for hiring-out fires and maintaining them. The Company have year by year contributed their quota to such facilities; and this season again they have produced a series of designs which provide further facilities in this way. They have designed a fire, with a series of casings, and every other part interchangeable, so that the fires will at once suit any grate in a house, meet the varied fancies of customers, and provide for economical maintenance and repair. A bed-room fire grate is different from a dining-room grate, a dining-room grate different from a study grate, and so on; and each position needs a gas-fire with a different shaped top—as the case may be, round, straight, or flat. The new series of fires is known as the "A. B. C.;" the title for the series being obtained from the individual titles of the fires—viz., the "Arabian," the "Bavarian," and the "Castilian." When a gas manager is considering the question of the hiring-out of gas-fires, he naturally discerns difficulty and expense in keeping in stock the parts necessary for fires of many different designs. But in this series, the main parts of the casing fitting the same base and fire, and the parts of the base and fire being all uniform in the series of fires, it is easy to meet the requirements of consumers, and yet not have to keep in hand a considerable stock of wearing parts for replacements and repair. Thus the wearing parts of a 10-inch fire are interchangeable with any other 10-inch fire of the series; and the parts of a 13-inch fire can be used with any other 13-inch fire of the series. In maintenance this is an exceedingly important feature. The wearing portions of a fire are, of course, the brick, the guard, and the burner—in short, those portions that are subject to the immediate influence of the heating by the flames; and it may be readily imagined how greatly it will reduce the question of maintenance to have on hire a series of fires the wearing parts of which are applicable to all, whatever the design of the outer casing. One of the illustrations shows how easily the whole fire is capable of being taken to pieces for cleaning and renovation. By the removal of two thumb-screws, the fender (to which are attached the two upright side arms and a white enamelled burner cover), can be lifted away, the burner can be slid out, the fuel guard can be taken off, and the fuel and fire-brick taken out. The complete dislocation of the wearing parts of the fire is, in short, the work of but a couple of minutes; so that it is seen to what a simple and economical thing maintenance has been reduced.

The parts, in view of the illustrations, hardly need any description; but it may be briefly mentioned that the principal brick is in one piece (about this there is something more to notice presently) and the burners have been provided with duplex orifices instead of single ones. The duplex nozzle gives in the place of one flame two flames distinct at the bottom but uniting at the top. The object of this is, without increasing the consumption, to give a larger surface of flame over the fuel to be heated. The fuel is made oval in section, and in longer pieces than formerly, so that one row of pieces of fuel standing vertically over the burners, with a single row laid horizontally along the top, is all that is required. It is agreed by almost everyone now who has made a study of the gas-fire that the nearer to the front one can bring the brick, the greater the radiated heat; but the difficulty is that a shallow fire means a shallow appearance. To get over this, and still have a shallow fire, the Richmond Company in this series have provided for a false brick back. That is to say, there is a brick that stands in front of the ordinary one. The dual brick has a dual advantage. A big heat radiation is obtained with the single row of fuel; and the false brick (which is quite an inexpensive thing) preserves the larger one by shielding it from the fiercest of the heat which—through expansion and contraction and mechanical disintegration—produces cracks which are an eyesore, and ultimately the destruction of the brick. Another new feature in this series of fires is that this season the Company have adopted a separate gas and air adjustment. Last year, the air and gas were adjusted by one action; but, while the idea would be good if in all places the gas was of the same constitution and pressure, separate

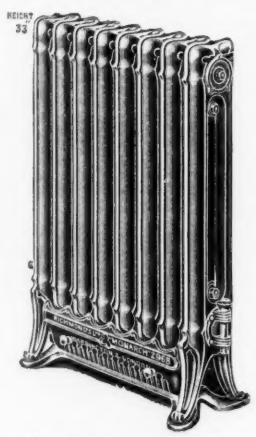
The "Arabian" Fire.

The "Bavarian" Fire.

The "Castilian" Fire,
Showing the Interchangeable Parts.

adjustment for varying conditions is no doubt preferable. The gas-adjuster is simply a needle-valve, with a grooved head to be turned by a screw-driver; and, when the gas is properly adjusted, a screw collar locks the adjuster in position, so that the adjustment cannot be accidentally altered. A small feature which the Company have patented merely for protection is a simple method of constructing the needle valve so as to ensure the cone-shaped head being kept central with the outlet from the gas-injector. A movable collar is used for the adjustment of the air supply; and the mere turning of a nut locks the collar in position when the regulation is completed. While provision for gas and air adjustment is necessary in the causes of efficiency and economy, experience shows that, with gas-fires, it is just as well that the facility of adjustment should not be so great as to court constant interference. In this case, the gas-adjuster requires a tool in the nature of a screw-driver for its movement; and the air-adjuster is placed out of sight under the fender of the fire, and yet is accessible to the fingers. A further feature—small but convenient—is that the connecting elbow to the fire can be turned, so that connection can be made with a gas supply on the opposite side of the fire to the entrance of the burner without any exposed connection or tortuous pipe-fitting. The fires are all fitted with sheet-steel backs, so forming a hot-air chamber, and preventing a large escape of heat up the chimney.

With regard to the general appearance of the fire, the illustrations speak for themselves. The characteristics of the design are tasteful. We like the wide, deep-set ornamentation which brings the features into striking relief, and enables any dust to be readily removed. The wide and deep tracings are also beneficial in yet another way. The finishes in "Porcellanite" colours have become very popular, harmonizing as they do with all schemes of room decoration; and, with deep grooves, the application of the Porcellanite does not destroy the effect of the design by filling them up. We like the design; and in use the fire emits a good heat, and is altogether very attractive. The Company assert that it is reasonable to claim that from this fire, they can get approximately 15 to 20 per cent. more heat than from their productions of last season, with a gas consumption of 18 to 20 cubic feet at 2 inches pressure.



The Single-Tube Gas-Steam Radiator.

Looking round the Company's show-rooms, there are several other interesting features; but space compels us to pass them by with only a few words. The Company have this year brought out a single-column gas-steam radiator, of the "Monarch" series. This is very useful for narrow halls and passages. On the gas-steam radiator question, it would be easy to dilate on the advantages of such arrangements for the heating of large and well-ventilated halls and other places of public assembly, compared with central steam-heating systems, which involve much labour, and heavy capital expenditure. A cheap line is a fire, named the "Persian," with a 9-inch burner, and fitted with a single row of fuel, copper reflectors, and so forth. In use, this fire gives a good account of itself. Handsome are the finishes of other stoves; but with a mention of the "Neptune" water-heater and circulating system, the efficiency of which may be tested at the London show-rooms, we must leave the Richmond Company's interesting collection of new goods.

Parkinson and W. & B. Cowan, Limited.

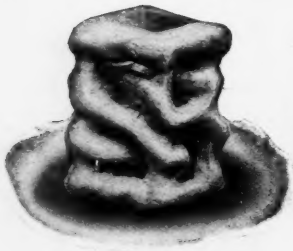
In order to meet the demand for fires with single row of fuel and gas and air adjuster, Messrs. Parkinson and W. & B. Cowan, Limited, are introducing for the coming season a number of new patterns so fitted, foremost among which are the "Coral" and "Opal" here illustrated. The patent adjuster is extremely simple; provision being made for manipulating the gas and air separately, while the fire is burning, by means of the knob and slide, lettered B and D. The adjuster is placed at the side of the

"Coral," with 10-Inch Fire-Opening.

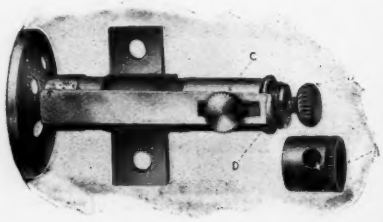
fire—quite accessible; and repeated tests have proved it to be very efficient in action. The fuel used is of special registered design as illustrated; the important improvement being that, in order to obtain greater duty from the gas consumed and a more brilliant incandescence, points are projected inwards to meet the flame. Owing to the perfect combustion secured by means of the gas and air adjuster, the full effect is obtained from this new pattern fuel; and a remarkably hot fire is realized at an exceedingly small consumption of gas. Among other patterns of fires may be mentioned the "Topaz," "Cameo," "Corona," all of

which, together with the "Opal" and "Coral," are suitable for use in dining-rooms, nurseries, &c., as well as slot gas-fires if so desired. The designs are such as will suit varieties of style and many tastes, and the stoves can be supplied in various finishes. including porcelain enamel in many shades, electro bronze, &c.

"Opal," with 8½-Inch Fire Opening.



Registered Design in Fuel.



Patent Adjuster.

Omega Odourless Gas-Stove Company, Limited.

The "Omega" Company have what is described as "a new departure" in gas-heaters. It is a stove constructed on their ordinary scientific system for producing a rapid circulation of hygienic hot air; but, in addition, it is fitted with ruby squares, through which it diffuses a warm and cheerful glow. Therefore, while giving off great heat, the stove will also look hot. The new heater will be distinguished by the letters L A and No. 145. The height is 26 inches; and the size at base 12 inches square. The weight is 34 lbs. Full on, the gas consumption is 10 cubic feet an hour at 2 inches pressure; and the stove is suitable for a room 10 feet square. It may conveniently be mentioned here that a large type of the "Omega" heater has recently undergone a scientific test by Dr. E. H. Cook, F.I.C., F.C.S. The experiments were made to ascertain the exact effects on the air of a room due to the operation of an "Omega" heater, and also to determine the nature of the products of combustion. The figures, taken from a typical experiment, and given below, are significant, in view of the continual discussion as to whether a flueless stove is compatible with a healthy condition of the atmosphere in the apartment in which it is used. The only condition to be observed is that the ordinary and intelligent means of ventilation are to be employed, such as would, under any circumstances, make the room fit for human occupation. The stove used was of the type known as F3; and the following are the particulars of the report: Duration of test, seven hours; area of room, 4170 cubic feet; mean gas pressure, 2·47 inches; amount of gas used during test, 238·5 cubic feet; gas consumed per hour, 34 feet; carbon dioxide produced per hour, 18·7 cubic feet; percentage of carbon dioxide in room after seven hours, 8·6 parts in 10,000; acetylene, *nil;* carbon monoxide, *nil;* sulphur dioxide, *nil;* unburnt gas, *nil;* average temperature rise, 9·7° Fahr.; amount of gas to raise 1000 cubic feet of air 1° Fahr., 0·607 cubic foot; smell in room, none; general remarks, the combustion was complete, and no harmful products evolved.

New Pattern of "Omega" Gas-Heater.

Wilsons and Mathiesons, Limited.

This firm draw special attention to their "Bijou" gas-fire, the design of which is up-to-date, and in keeping with the prevailing fashion of restful designs. It is furnished with special double length fuel; and the burner, in addition to being loose, is fitted with gas and air adjustment, under special licence from Messrs. Bray and Co. The top of the stove is either fitted with a boiling-burner or with a double-flue top, having holes cast through for the heating of the air of the room. The advantage of this top is that a great amount of heat is taken out of the waste products before they escape into the chimney. Some idea as to the utilization of formerly wasted heat may be gained from the fact that, in an ordinary stove with the direct-flue outlet, the flue temperature will reach 500° Fahr.; but with the double hollow top, the flue temperature is only about 300° Fahr. Seeing that heat that does not go up the chimney must pass into the room, it is obvious that a great advantage is obtained by this addition, and as this does not interfere in any way with the artistic appearance of the stove, or add seriously to the expense, it is without doubt, the firm submit, a desirable combination to obtain as much radiant heat as possible from the fire by means of the double-length fuel, and then to economize the waste products—heating the air of the room directly by convection. Wilsons and Mathiesons are also making a speciality this season of porcelain enamel on their stoves; the "Bijou" fire lending itself specially to the process of both majolica and chimatto enamel in combination.

The Wilson "Bijou" Gas-Fire.

The firm have also introduced a patented lock-tap. This is intended for the use of hotels, &c., where gas-fires are becoming extensively used in bedrooms, as by the use of the tap gas cannot be obtained without the assistance of the servant to unlock it. On the tap being turned off, it locks itself. The tap—a sample of which we have inspected, and can speak to its effectiveness—should have an extended use.

John Wright and Co. and Arden Hill and Co.

These united concerns have several new features in hand for the coming season, which promise to be both of value and interest. They are not quite ready for the publication of a description; but, as early as possible, we shall give an account of the features of their fresh productions.

Carron Company.

This Company inform us that they have some new gas-fires in course of preparation; and shortly we hope to publish a description of them.

Davis Gas-Stove Company, Limited.

This Company inform us that they are this season introducing some novel and important features into their new series of "Diamond" gas-radiators. In the matter of gas-fires, they are

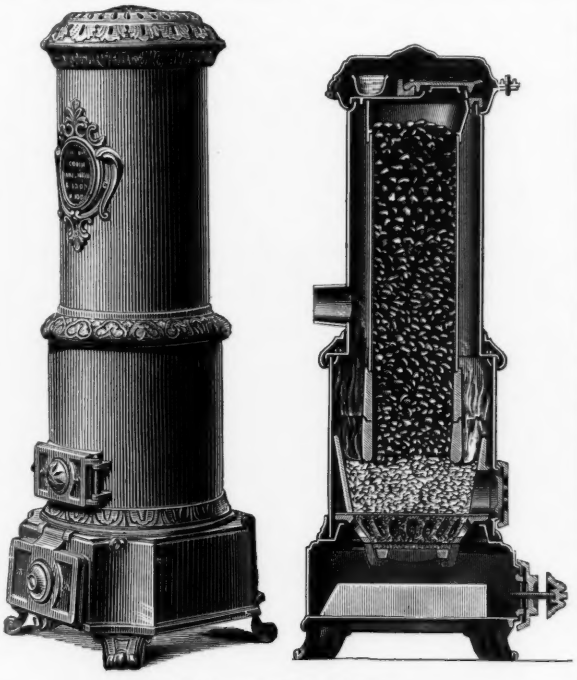
producing some new and very effective designs, incorporating heating chambers, single-row fuel, and gas and air regulation.

Imperial Stove Company.

This Company are also bringing out for the coming season a number of new designs in fires and other novelties. The encouragement received last season will induce them to make a special effort with their gas-heated steam-radiators. Additions have been made to the patterns; so that the Company can build up radiators with any number of double loops, from three up to fourteen, and in three different heights—viz., 27½ in., 32½ in., and 39½ inches.

A. G. Cloake.

Gas engineers who are interested—and what gas engineer is not?—in stoves to burn coke will appreciate the excellent results obtained with such stoves as are shown and sold by Mr. A. G. Cloake, the representative of the well-known works of Godin et Cie., of Guise, France. These coke-stoves are constructed upon scientific principles, calculated to yield the maximum amount of heat at the minimum cost. They are absolutely free from dust, back-draught, fumes, or smoke, and will burn continuously throughout the winter, if charged regularly as required, every 12 to 48 hours according to size. The appreciable advantages of having rooms warm in the morning, no fire-lighting, no dust or back-draught, have, Mr. Cloake informs us, established a permanent demand in England for Godin's stoves. It is evident that no expense or practical experience have been spared, in order



The Improved Coke-Stove.

to put on the market stoves which are absolutely perfect, reliable, and lasting. There are several hundred patterns, from the plain sheet-iron bodied stove, to the most elaborate designs, with heating capacities varying from 700 to 70,500 cubic feet, and suitable for the smallest to the largest rooms, halls, hotels, shops, churches, &c. The stoves can be porcelain enamelled in any shade to match the general scheme of decoration, with nickeled, brass, or copper mounts. While inquiring into the question of stoves, Mr. Cloake gave some information about the large works of MM. Godin et Cie. They were established in 1840, and 2500 hands are employed making cooking and heating stoves, for burning gas, wood, coal, coke, and anthracite, also general castings for the trade, such as enamelling muffles, annealing kilns, nickeling and galvanizing installations, and kilns for the manufacture of refractory fire-brick, &c. The firm enjoy a world-wide reputation for the production of fine castings. Their continuous moulding machinery—the only one of its kind in existence—permits of a comparatively unlimited output of castings, from which many British ironfounders are drawing an important supply.

[Other notices will appear in subsequent issues.]

The "London Gazette" recently contained a notification from the Inland Revenue Office to persons entrusted with the payment of annuities, dividends, &c., at home or abroad, that within one calendar month from the 21st ult., they must notify the office of the names and residences of the parties to whom such payments are made, and of the amounts paid to them.

IN THE LIGHTING SECTION.

No startling improvement, so far as we have been able to gather, seeks welcome for the coming lighting season; but advance has not been stayed. In the making of vertical incandescent burners, experience continues to bring innovation in detail. But it is on inverted burners that most work has of late been expended; and they have been brought up to a high pitch of perfection. As we look back at the difficulties associated with the first burners, one can but marvel at and admire the perseverance that has conquered the infantile troubles. What at one time looked to be impossible has been proved to have been possible by achievement. One of the discoveries of experience has been the necessity for a nice adjustment of the volume of gas supply to the burners without diminishing pressure; and some excellent regulators which accomplish this are now attached to several of the new burners. The regulation of the air supply is really a secondary consideration when there is the requisite fine control of the gas supply. To this discovery, and to the provision of regulators of the necessary type, may be attributed perhaps more than to anything else the excellent results in illuminating power and general efficiency of these burners. Some of the efficiencies now quoted by makers are remarkably high; but it is easy to test veracity when it can be done by a photometer. Another matter to which increasing attention is being paid is the diverting of the products of combustion so that the primary air supply is not vitiated. Progress in performance has been comparatively slow but sure; and now the reputation and popularity of the inverted burners are spreading rapidly, while their artistic appearance is also a strong recommendation. Consequently, we hear of big business being done in them in all quarters. There is one point upon which necessary attention is now being bestowed, and that is the provision above the inverted burners of means for preventing the tarnishing of the metal and the accumulation of incrustation. Some successes are recorded in the following paragraphs. It would be well if gas managers would inform consumers that the occasional use of a damp cloth will remove all unsightliness in this respect. In high-pressure lighting, too, we have only to call to mind the display at the Dublin Exhibition, to be thoroughly contented with the advance in that branch of the business.

George Bray and Co., Limited.

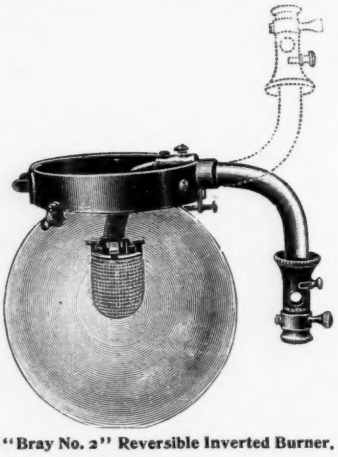
On the next page is reproduced a very interesting photograph, taken at 8.45 one evening, in the Lewisham Postal Sorting Office. Of all places where an excellent light is required, a letter-sorting office must stand out prominently; the good light being necessary to assist rapid work and the deciphering of the hideous writing with which letters are frequently addressed. The task of the post-office letter sorter is difficult enough at all times; but his troubles are increased if he is not favoured with a good light for his night duties. The sorting-office pictured here is lighted by the Bray inverted burner, fitted with bye-passes; and well lighted it is too—the light being directed exactly to the places where it is required by the sorters. We are sorry the effect of the lighting is largely lost in the reproduction and printing. But it is sufficient to know that the photograph was taken by the light of the burners, and that this is not the first place in connection with our great Post Office system in which Bray's inverted burners have been installed. They have found their way into several other post offices in the Kingdom, and are giving general satisfaction, both in respect of efficiency and economy. That their use spreads in post offices certifies to the truth of the statement as to general satisfaction. As a precaution against a globe being broken, and the pieces while hot falling among letters, a wire basket is suspended from the spring holder by which the globes of the lamps are supported.

At the London show-rooms, at 17, Farringdon Street, all the firm's new improvements in incandescent burners are to be seen. Their reversible inverted burner—which can be fixed to pendant, standard, or bracket without the use of an adapter piece, has all the metal parts exposed to heat hidden from view, and has the before-mentioned spring-clip support for the globe—has hitherto been made in the large and the bijou sizes. But the firm have now brought out an intermediate size, which will be known as the No. 2 reversible burner. The ordinary sized inverted burner consumes 3½ cubic feet an hour; but this intermediate burner only uses 1½ feet, and gives a light of 40 candles. Its illuminating power is good; and it meets the want of a burner for those situations where a full-sized burner affords more light than is essential, and where the light of a single bijou is insufficient. This burner (as are also the No. 3 burners this season) is fitted with the Bray patent gas-adjuster, which permits the control of the supply of gas to the burner without decreasing the gas pressure. The new "Bray '07" vertical inverted burner (so called to distinguish it from the swan-neck reversible burner) is fitted with an earthenware deflector, which can be revolved so that it can be cleaned without removing the globe or mantle. The earthenware deflector, besides diverting the current of the products of combustion, acts as a reflector, and so diffuses the light. The Nos. 2 and 3 reversible burners and the vertical inverted burners can be had fitted with or without a bye-pass, which is so fixed that the point of ignition is above the mantle, and so ensures that the mantle suffers no violence from the use of the bye-pass.

Quite a new departure is the "Bray '07" "C" burner fitted with

Lewisham Postal Sorting Office Lighted by Bray's Reversible Gas-Burners.

the patent gas-adjuster, and with or without bye-pass. In certain respects, the burner is unique. It is constructed in four pieces, which simply slide together; and thus all parts can be cleaned, and are interchangeable. The burner has a long mixing chamber,



"Bray No. 2" Reversible Inverted Burner.

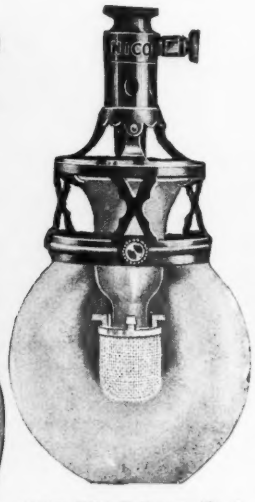
"Bray '07" Vertical Inverted Burner.

with the top of the interior tube reticulated for some distance down so as to assist in the thorough mixture of the gas and air. A brushing out at wide intervals will keep the interstices free. The burner is also constructed with a nickel tip, which is non-corrosive. It will not burn out; and it is stated that dust will not adhere to it, as in the case of wire gauze. Tested without a chimney, the illuminating power attributed to the burner is 24 candles per cubic foot of gas consumed. It is therefore an economical burner, and promises to win a large share of favour. The firm have equipped themselves thoroughly for meeting the demands of the coming season. Looking round their exhibits in the show-room, it is seen that they have, among other things, a good range of anti-vibration fittings. The mantles they supply are all of British make.

New Inverted Incandescent Gas-Lamp Company, Limited.

The New Inverted Company have had so many good features among their burners and fittings that we had begun to think they must have arrived at the ultimate point of success in high-class production. But experience of the "Nico Intense" lamp, of the new (or No. 5) "Bijou" gas-burner, and of the "Nico" regulator, which are the three foremost specialities with which the Company are in the field this year, has disabused the mind as to finality in

"Nico Intense" Lamp, Half Full Size.



"Nico Bijou" Burner No. 5 Half Full Size.

production and results. For, applying the test of efficiency, never before have the Company succeeded in gaining such results as are procurable with the "Nico Intense" lamp and the new "Bijou." How much this is due to the "Nico" regulator, and how much to other improvements in the make of the burners, we cannot deter-

mine; but that proper regulation does play an important part in efficiency, we are fully persuaded by the use of similar burners both with and without the regulator. The "Nico" regulator was described in our issue for July 2; and therefore all we need say further about it now is that the Company have received some excellent accounts of the usefulness and effect of the arrangement from different parts of the country. We prognosticate it will be a popular feature of the burners during this winter season.

Regarding the new "Bijou" (or No. 5) burner, it is on the same principle as the Company's now well-known No. 4 burner, with mixing chamber, but is practically the same size as the No. 3 Bijou. The burner has been produced after most exhaustive tests and experiments; and it can certainly be recommended as highly efficient and satisfactory—a photometric test having recorded an illuminating power of 30·5 candles, with a consumption of 1·3 cubic feet per hour, which works out to 23·4 candles per cubic foot of gas. On seeing the burner alight, and noting its good performance, it would be little short of an impertinence to question the accuracy of the test—in fact, it is well within the mark using 15-candle coal gas. The burner is perfectly silent, neat in appearance, thoroughly well made, and is fitted with the "Nico" regulator, which enables it to be adjusted to suit practically any conditions of gas supply.

In regard to the "Nico Intense" lamp, this can be thoroughly recommended as a nicely finished article, at a reasonable price. The lamp is on the self-intensifying principle; the mantle being inside an inner glass cylinder, and is used with an opalene or etched globe according to requirements. Photometric tests of the lamp record an efficiency of 28·4 candles per cubic foot of gas consumed. One of the special features in connection with the construction of the lamp, is that there are air-holes in the regulating shutter of the bunsen only on one side, and that is diametrically opposite the opening for the escape of the products of combustion. This construction prevents the entering air being contaminated by the escaping products of combustion. The lamp is fitted with a "Nico" gas-regulator, and can be had finished in polished brass or black bronzed. Judging from the manner in which it has already been received on the market, it is bound to be a popular lamp during the coming lighting season.

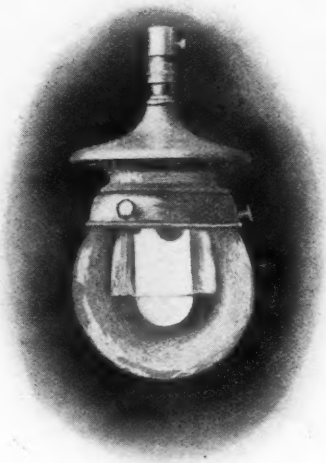
Ecliptic Gas-Light, Limited.

The Ecliptic Gas Light, Limited, are now producing their well-known "Palace" burners—in which, by the way, they have a range to meet all requirements of place and purpose—with china deflectors, combined with a novel arrangement (which has been provisionally protected) of combining brass and aluminium, so that while only aluminium that will not tarnish or discolour is presented to the eye, the burner is so cased with metal, that it retains all the strength of a burner made in the ordinary way. We have seen a number of these lamps, and are extremely pleased with the effect. It is unquestionable that they effectually prevent the eyesore of discoloration and incrustation above the burner. In the "Palace Extra," for example, we have a lamp

The Attachment of the "Palace" Burner to a Bracket.

the head of which is constructed of brass with aluminium spun over it. The "Palace" lamp, too, is made with a white china top, and aluminium support for carrying the globe. The "Medium Palace" has a china top; and the globe is supported from the bottom by a patented arrangement. The same lamp is made with a metal top covered by aluminium. The series of "Baby Palace" lamps and other types have been treated in the same way. They have all a natty and really handsome appearance; and for them we anticipate there will be a considerable amount of patronage.

To meet the demand for a burner which is readily adjusted, the well-known movable plug is now fitted with a special arrangement of needle regulator, the needle of which cannot very well be put out of adjustment by careless dusting or matters of that kind, as it is concealed, and so kept out of harm's way. A demand for cheaper burners has also been created; and such burners can likewise be now supplied with many of the Ecliptic Company's specialities, and fitted with the adjustable nipples. The Ecliptic Company do not appear to be favourably disposed to adjustable nipples, though they comply with the demand for them; for Mr. J. Reid, the Manager of the Company, states that he "is convinced that the craze for adjustable nipples will only tend to emphasize the advantage of the movable plug and the gauged nipple. Gas-fitters have lately considerably improved in their



The "Palace Extra" Burner.

treatment of inverted burners; and it will not be long before they will all be able to fit the right nipple in a burner." The Company are showing a novel and attractive application of the ordinary "Palace" burner to a bracket. The bracket lends itself very well to the pneumatic valve or the "Norwich" switch. It is particularly neat in appearance; and attention may be directed to the pilot-light tube, which, it will be observed, is arranged in an artistic manner. The second illustration is the new "Palace Extra" burner, which, it is claimed, will give 120 candles for 4 cubic feet of gas. The burner is fitted with an inner chimney, and the products of combustion are evenly distributed throughout the whole circumference of the burner, which does away with all smoke and discoloration of the upper part of the fitting. The burner is fitted with an adjustable nipple and china top.

Messrs. Bland and Co.

The Bland inverted burner, as predicted when it first of all came on to the market, has realized a large measure of popularity; and several authorities—among them Mr. W. R. Herring and Mr. J. D. Ashworth—have spoken as to the burners fulfilling in all respects the claims made for them by Messrs. Bland and Co. Inquiry as to what is new in connection with the burner has elicited several interesting points. An improved gas-regulating nipple, with side adjustment, has been adopted. But the triangular form of needle communicating with the round hole of the gas-injector has been maintained; so that, while the quantity of gas passing can be controlled, the pressure is in no way affected. Then the firm have introduced an anti-lighting-back arrangement, which, we are informed, effectually prevents lighting-back under either low or high pressure; and, while fulfilling this object, it also greatly increases the lighting efficiency of the burners. Recent tests made by a gas engineer attribute to the burner an efficiency of 32·4 candles per cubic foot, which works out to 97·2 candles for a gas consumption of 3 cubic feet. This is such a remarkable result that there will be a desire on the part of gas engineers to make personal corroboration. A new form of protecting hood has also been devised, which diverts the products of combustion from the mixing chamber, thereby ensuring a pure and cool supply of primary air, and also prevents any direct upward flow of the products, and so obviates discoloration of the fittings and ceiling. The hoods, we learn, are made of a non-corrosive metal, which will not discolour or accumulate incrustation. The importance of this needs no words to emphasize it. The firm's bijou burners have been improved in every respect. They are all fitted with the patent gas-regulating nipple, the anti-lighting-back arrangement, and a steatite nozzle. These small burners are credited with an efficiency per cubic foot approximating to that of the larger types of the burners. For factories and workshops, special burners have been made, with enamelled green iron shade and white reflector, and the fittings are of a character befitting their use. The principle adopted in the Bland

burners, of placing the mantles in the globe and not attaching them to the burners, has proved invaluable for maintenance work. In numerous places where there is heavy machinery running, and where mantles were formerly constantly meeting with destruction, the application of this system of supporting the mantles has, we learn, redeemed the reputation of incandescent gas lighting. In glassware, it is found that Messrs. Bland and Co. have added many new designs—making a special feature of the Adam style of decoration, which is now so much the vogue.

The New Nipple

"B" Burner, with Adam Globe.

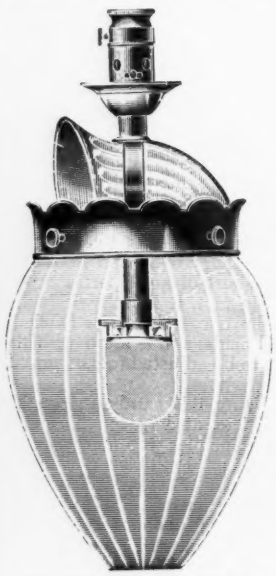
Fitting in Adam Style of Decoration, with Globe to Match.

No. 7 Factory and Workshop Fitting.

The fittings supplied by the firm are of the very best workmanship; and a special feature of them, as shown by one of the illustrations, is again the Adam style of decoration. It may be added that, in order to cope with the large increase of business, Messrs. Bland and Co. have found it necessary to take new offices and warehouse at No. 29, Little Trinity Lane, E.C.; but the London showrooms will still be at No. 63, Queen Victoria Street. A branch for the North of England has also been opened at No. 20, Fennel Street (off Corporation Street), Manchester.

Falk, Stadelmann, and Co., Limited.

In the extensive show-rooms of Messrs. Falk, Stadelmann, and Co., Limited, interest is always aroused, and invariably there is something new to be found. This season is no exception to previous ones; but there are only two or three new examples that we can describe. In the first place, there is a new pattern incandescent burner, with a solid steatite burner head (non-corrodible), with lift-off top. The burner is fitted with an air-shutter and gas-adjuster, which not only enables the consumer to adjust the burner at the point of fixture, but to effectually keep the gas-inlet free from dust or foreign matter. One aim has been, in designing this burner, to keep the price as low as possible, in order to bring it within the reach of the general public. The patent gas-adjuster is also applied to a cheaper quality burner with a screw-head, as well as to inverted burners. The part may also be bought separately; and will be found suitable for any inverted burner.



The "Veritas Shell" Burner.

A Side Reflector for Shop Windows.

The Patent Gas Adjuster.

A New Pattern Burner.

The "Veritas Shell" inverted burner—a name derived from the shape of the porcelain top—is an attractive production. It encloses the glass holder on three sides—leaving an exit only at the fourth; thus effectually screening the fittings from discoloration by the products of combustion. It has also been found that the small discharge hole accelerates the flow of air through the globe, and produces a more brilliant incandescence in the mantle. The burner is also made in bijou size. The ordinary "Veritas" inverted burner we find may now be had in swan-neck as well as bracket form; and also each variation in the bijou size.

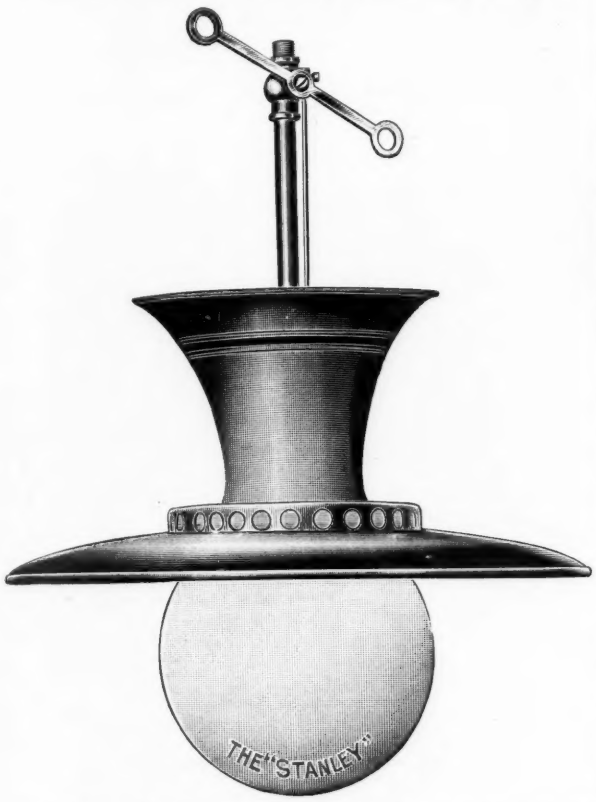
A large display of glassware is now being made in the showrooms; and apart from the many hundreds of different shapes, patterns, and colours to be had following on the usual lines, there are several novelties.

The opalene side reflector for inverted burners is a registered article of the Company. The idea is primarily for window lighting. The light is reflected on to the displayed goods, while the dazzling brilliancy of the mantle is screened from the observer's eyes. The bulb is also a registered pattern, and will fit nearly all open type shades for inverted burners. Apart from giving the inverted light a nearer approach in appearance to an electric light, the bottom of it is closed, which prevents the mantle ash or ring, should it break while incandescent, from falling upon inflammable material below. The constriction at the bottom of the glass acts as a baffle to the intake of cold air, and prevents the bunsen flame from being driven back from contact with the surface of the mantle, as is common with glasses having a single hole in the centre. Already the Company are experiencing a large demand for this particular glass; and it should certainly be appreciated by Insurance Companies.

Moffat's Limited.

Under the name of the "Stanley," Moffat's Limited have now introduced into their large range of lamps a new inverted cluster light, which it may be readily admitted is a very decided step in

advance of the firm's earlier efforts in this direction. The lamp is a three-unit inverted light, but constructed within a hitherto unattainable compass. The burners are strongly made, fitted with air-regulators, mixing-chambers, and regulating gas-nipples to ensure perfect gas mixture. The glass bowl is completely enclosed at the bottom; the air supply being drawn in from above, but through separate passages from the outlet, so that a constant supply of pure air is always available for the burners. The lamp is extremely compact, measuring only 15 inches across the reflector

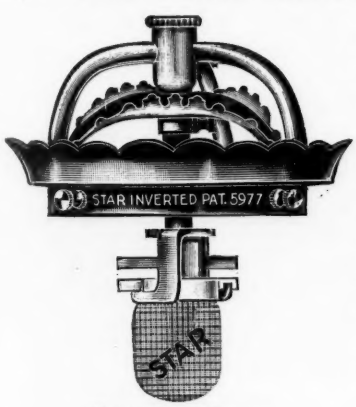


and 18 inches from cock to bottom of bowl. It is consequently suited to practically any room where a lamp of this class is desirable. In appearance, it is exceedingly attractive. In fact, it looks even better when hung than in the illustration—this being due to its small size, its excellent finish, and the peculiar character of the bowl. It is finished in white porcelain enamelled iron with gold lines, and is made for hard wear. The light given is of about 250-candle power, with a gas consumption of 10 cubic feet per hour.

The well-known "Sydney" lamp, which has been deservedly popular ever since its advent, has been further improved by introducing a supplementary reflector, which is fixed just above the glass bowl, so as to break up and deflect the current of air entering through the perforations. By this device, the bottom of the inner chimney is hidden from view, and an additional amount of light is reflected downwards, greatly improving the appearance of the lamp; while it also acts as a sort of baffle-plate in the case of outside lamps, and renders them thoroughly wind-proof in the worst of weathers.

Star Inverted Incandescent Burner Company, Limited.

The improved "Star" inverted burner has also its new and important features. Metal inverted burners have hitherto suffered under the heat of the bunsen flame. This has especially been the case when, owing to complete combustion, increased heat was produced. In consequence the movable burner tube has had to be more or less frequently renewed. The Star Company recognizing this defect, the patentee has for months been engaged in evolving a method to obviate and nullify the destruction. The improvement which he has effected consists of a magnesia burner tube, that is impervious to heat, and also effectually prevents the carbonization of the waste products upon the mantle rim. The "Star" burner has always stood in high esteem for its light-giving power; and the improvement will enhance its popularity.



The Improved Burner.

Wholesale Fittings Company, Limited.

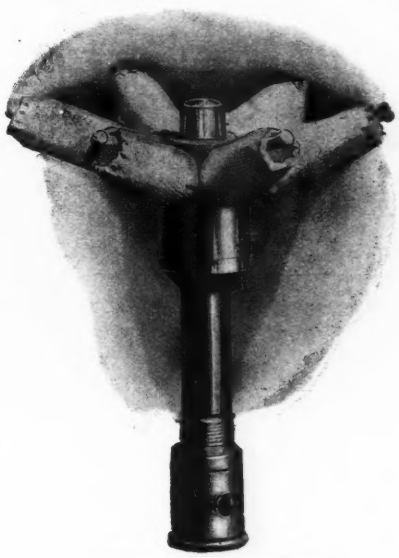
In addition to the "Yotto," the "Pyrol," and the "Kohab" inverted gas-burners, the Wholesale Fittings Company are this season calling special attention to the "Ezol" and "Bonbac" lamps. Both burners are fitted with special gas-regulators; and to the "Ezol" is attributed an illuminating power of 100 candles, with an hourly consumption of 4 cubic feet of gas, and to the "Bonbac" 80 candles, with a gas consumption of about 3 cubic feet. The "Ezol" is fitted with a closed globe; and the products of combustion are so diverted, as not to affect the primary air supply. The appearance of the lamps is good, as can be judged by a glance at the illustrations.

The "Ezol."

The "Bonbac."

Lune Light Company.

This Company are the sole patentees and manufacturers of the unique "Lancaster" burner, in the design of which the object has been to make an incandescent burner that shall distribute its rays, without the aid of reflectors, &c., at an angle where the light is most effective and where it is most required—viz., an angle of from 30° to 45° downwards—and to eliminate all shadows on either ceiling or floor. The head of the burner is made of a special anti-corroding composition. The bunsen flames issue out of a number of holes in this head in a horizontal direction, and above the holes a corresponding number of stalks project in a slightly inclined upward direction, and on each stalk rests a small mantle.

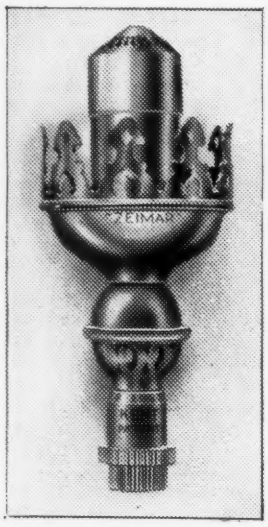


The "Lancaster" Burner.

"The horizontal flames," it is submitted, "come far more actively into contact with the air than is the case with the flame of a vertical burner, with the result that the combustion is absolutely perfect, and obtained without using a chimney to increase the draught—the illumination of the mantles being intensely brilliant, and no shadows on either ceiling or floor." The burner is provided with a special regulating nipple, which can be instantly adjusted while the burner is in use. It consists of a small cap which screws down upon the nipple, and which can be turned up or down with a pin, until the mantles become perfectly incandescent, thus showing that the right amount of gas is passing through the nipple. The mantles are specially manufactured, and of exceptional strength, having an asbestos ring top and bottom. By reason of their size, and the horizontal position in which they are carried, they will, it is stated (without the aid of anti-vibrators), stand a larger amount of vibration than any other burner on the market. Should a mantle be broken, the burner is not affected in the slightest degree, as the loss of light is scarcely noticeable. The burner can be used with the remaining mantles until it is convenient to replace the one broken.

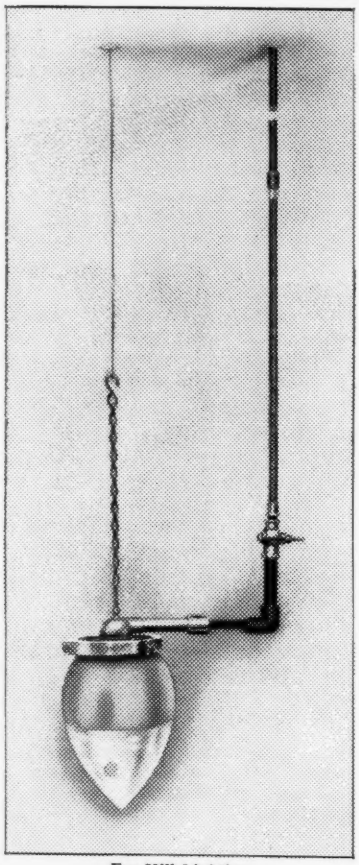
Ramie Company, Limited.

In the "Zeimar-Kent" patent burner, the Ramie Company, Limited, believe they have the "best and most scientific" upright burner that has yet been made. Whether this is so or not, we need not argue here. But that the burner can maintain a good position among its contemporaries is proclaimed by a test made against a 10-candle Harcourt pentane lamp, with a Simmance-Abady "Flicker" photometer, and using 15-candle power gas at 12-10ths pressure, when the result was equal to 20·92 candles per cubic foot of gas consumed. Beyond this nothing is required to give assurance that the burner has been constructed in the best possible manner for securing a high duty. The burner is fitted with a readily removable burner cap (so that it can be easily cleaned) and a regulating-nipple. The Company have also been turning their attention to mill lighting; and the latest fitting devised is one by which the gas is brought down, and fed into the bunsen tube of the burner, by iron tubing while the inverted lamp itself is suspended by a chain from the ceiling. A patent fitting and inverted burner has also been devised by the Company, whereby the inverted burner can be applied to ordinary street lanterns cheaply, and yet effectively.



"Zeimar-Kent" Burner.

"Zeimar" Patent Fitting and Inverted Burner for Street Lighting.



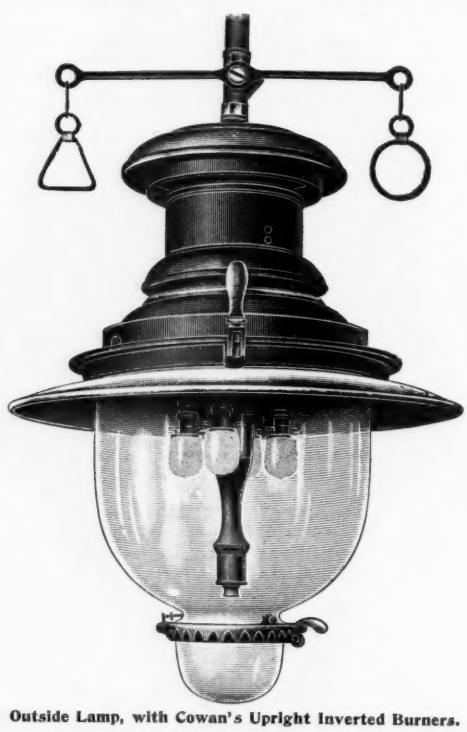
For Mill Lighting.

Messrs. Guest and Chrimes.

A large range of high-power lamps are provided by Messrs. Guest and Chrimes for this lighting season. It is interesting to note how, in these lamps, the inverted burner predominates over the vertical burner; and we must say that, for cluster-burner lighting in large suspension lamps for shop and outdoor use, the inverted burner is more sightly than those fitted with vertical burners. Two or three of the new lamps may be described briefly. The first one is a hinged bowl shop lamp, with inverted burners. It is a lamp of good appearance, and the points that go to make up a lamp in which utility is of first importance are present here. The lamp is enamelled in art colours, with gilt lines. It has a 16-inch reflector, and is fitted with a bye-pass lever cock, and pilot light; and the cast brass burners are detachable, and have non-corrosive magnesia nozzles. The mixing-tubes are carried outside the lamp; so that it is absolutely impossible to contaminate the air supply. The flame will not light-back; and an illumination is afforded that is at once shadowless and of great brilliance. The consumption of gas per burner is only from $2\frac{1}{2}$ to 3 cubic feet per hour. The length of a lamp fitted with two burners is 21 inches, and fitted with three burners 24 inches. If desired, the lamps can also be fitted with a small separate outside controlling cock to each burner; thus allowing any burner to be shut off during use. For outside purposes, the newest series of lamps are being fitted with Cowan's upright inverted incandescent burners, as shown in one of the illustrations. This lamp has an olive green enamelled casing, with an 18-inch reflector, a $11\frac{1}{2}$-inch hinged glass well, a $4\frac{1}{2}$-inch lighting cup, with a bye-pass lever cock, and the patent upright inverted gas-burner. The lamps are fitted with two, three, or four mantles; and with a consump-

Shop Lamp, with Inverted Burners and External Mixing-Tubes.

Cowan's Inverted Burner, to Socket On and Off, with Smoke Shade.

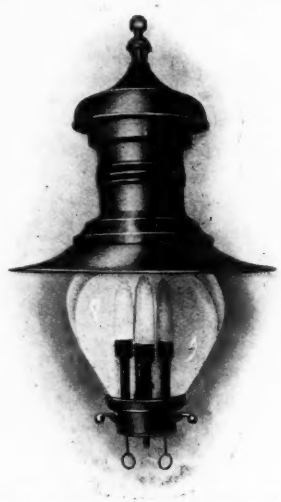


Outside Lamp, with Cowan's Upright Inverted Burners.

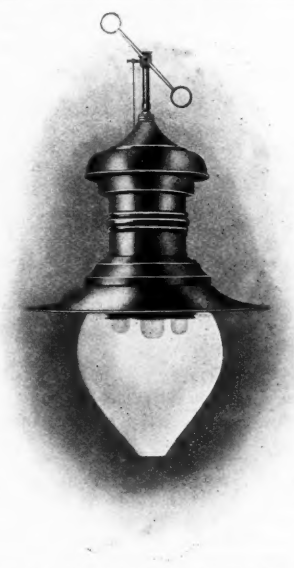
tion of 3 cubic feet an hour per mantle, a light of from 150 to 350 candles is obtained, according to the number of mantles fitted. Wind, rain, and dust proof, with perfect ventilation, and handsome appearance, are other attributes of the lamps. The length of the lamp shown is 27 inches. The lamps, it should be mentioned, are also made for the Welsbach-Kern burners. Cowan's patent upright inverted burners (to which reference has just been made) are an acquisition to the gas manager in improving street lighting, for they are also designed so as to be fitted in all existing lanterns, without any expensive alteration. The fittings are supplied for one to five burners. Each nozzle is made to socket on and off; and the consumption of gas is about 3 cubic feet for each mantle. The clusters look exceedingly well. The burner illustrated is one of the patentee's designs, to socket on and off, with smoke shade and holder for 5-inch globe.

Khoma Gas Arc Lamp, Limited.

Here we illustrate two new forms of outdoor lamp brought out by the Khoma Gas Arc Lamp, Limited. The lamp with the upright burners has several new features, which make it specially suitable for gas companies and corporation gas departments doing maintenance work. The mantle-shield which protects the mantles while the globe is lowered, and which has an opening allowing access to the mantles, is a strong feature, saving as it does breakage of mantles when attention is being given to the lamp at the time the wind is blowing. The bottom cup arrangement is also a novel feature. The Company have devised a fixed casting on the bottom of the lamp, which has a series of ledges over which small pawls work automatically, so that, when the globe is pushed up into position, these gravity-controlled pawls



"Khoma" Outdoor Lamp for Vertical Burners.



"Khoma" Outdoor Lamp for Inverted Burners.

automatically adjust themselves on the ledges. In the case of a globe being shorter than the ordinary size, the pawls would catch on the upper ledges; while in the case of a globe being longer than ordinarily, the pawls would catch on the lower ledges. Another special feature is that the pin in the bottom of the lamp has a hole in it, which communicates directly with the main valve. The hole in the bottom pin is closed by means of a screw plug, which can be readily removed, and a wire inserted into the valve, should it become clogged.

The outdoor inverted lamp is fitted with a cluster of inverted burners. One of the features is that the air-intake of the burners is isolated, and almost the entire burner itself is protected from the hot gases. In reality, only the extreme point of the burner becomes highly heated. This the Company regard as a valuable feature, as it eliminates the excessive heating of the mixture of gas and air, "which heating," they say, "tends to check the downward flow of the gases, as when they are hot they naturally have a tendency to rise. It also avoids the possibility of lighting-back." A further feature of the inverted lamp is that each mantle is provided with a separate flue; the several flues, being drawn, immediately above the mantles, into a main flue, which enables the production of a very pretty and effective lamp, and not a clumsy-looking one. The top of the lamp, in fact, is exactly the same as the top of the outdoor lamp with upright burners.

Parkinson and W. & B. Cowan, Limited.

Lamps for street lighting form an important department in the business of Parkinson and W. & B. Cowan, Limited; and in this department we find a large variety of recent patterns and important improvements of every kind. So many are they that we cannot illustrate or describe them all; but we may advise all interested to consult the firm's catalogue No. 54, which gives what we are unable to produce. The lamp No. 840 is one of the most popular patterns. It is made of hard rolled copper throughout, and is fitted with removable earthenware reflector, as well as a copper central flue, which prevents any possibility of down-draught. The whole lantern is strong and well constructed.

The firm, in their brasswork branch for street lighting, are making anti-vibrators, of which we illustrate No. 9. This anti-vibrator is found to be very efficient, providing as it does for both vertical and lateral vibration. It is adaptable to almost any class of incandescent burner.

Parkinson and Cowan's No. 9 Anti-Vibrator.

E. C. Hayward and Co.

The "Humphrey" lamp (for the introduction of which in this country Messrs. E. C. Hayward and Co. are responsible) has made for itself a position here by pure merit. It is well known, and calls for no description. The standard outdoor lamp is in largest demand; and following this the standard indoor lamp, the factory lamp, and the new pattern introduced last season —the nickel cylinder. The firm have successfully worked out the automatic distance-lighting of the lamps in series of any number.

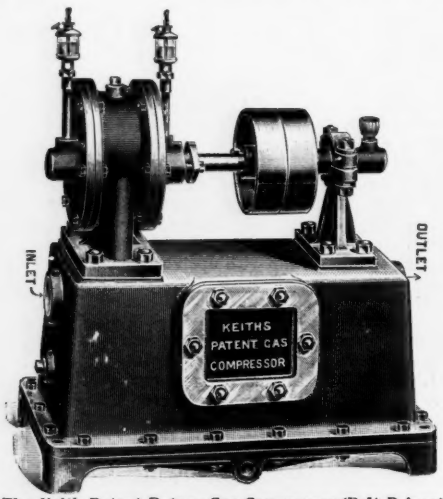
James Keith and Blackman Company, Limited.

This Company have attained a reputation in high-pressure gas lighting, which they have maintained by character and result of succeeding installations. The newest thing they have to show this year in connection with high-pressure plant is the Keith patent rotary gas-compressor. Where pressures of between 8 and 12 inches are required, the Company's original water-seal compressors answer perfectly; but there has lately arisen a demand for higher pressures than the water-seal compressors are capable of giving. Hence the new form of pressure-raiser. The following is the makers' description of the apparatus: "It consists of a positive rotary blower mounted on a cast-iron box base; the base containing an automatic pressure-regulating device. The blower has been specially designed for use with gas, and to give a steady delivery without pulsation. It is fitted with four blades having provision for automatically taking up wear. The lubricating arrangements have been designed with a view to making the apparatus suitable for unskilled attention; and the sight-feed lubricators used are gas-tight, and capable of working against pressure. Any surplus lubrication is discharged into the base, and can be drawn off at the bottom. The base has separate compartments for the low and high pressure gas, to which the gas supply and discharge are respectively connected. The pressure-regulating valve is fixed inside the base, and can be set to any pressure desired up to 5 lbs. per square inch by means of dead weights. Besides regulating the pressure, it returns all surplus gas from the high-pressure to the low-pressure compartment. It is extremely simple, and yet so sensitive that the pressure remains constant whether the full output or only a small quantity of gas is being used."

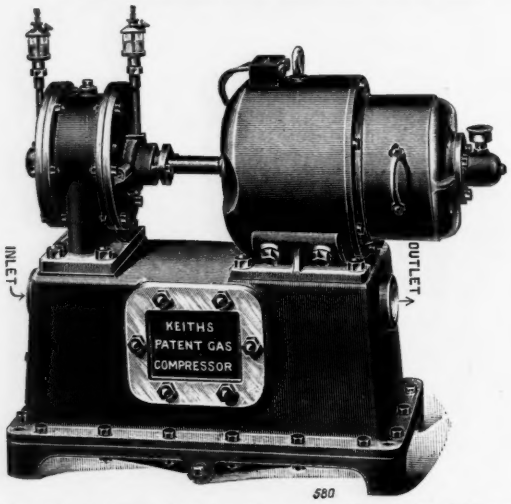
It is worthy of note that this apparatus is self-contained and complete as illustrated; the regulating-valve (wholly enclosed) preventing leakage or tampering with by unauthorized persons.

The compressor can be adapted to any form of driving; the

illustrations showing belt and electrical driving. It is made in five sizes, ranging from a maximum capacity, in cubic feet per hour, at 20 inches pressure, of 500 cubic feet up to 8000 cubic feet. The 500 cubic feet size only occupies a floor-space of



The Keith Patent Rotary Gas Compressor (Belt Driven).



The Keith Patent Rotary Gas Compressor (Electrically Driven).

23 in. by 12 in., and the 8000 feet one 48 in. by 29 in. Where floor-space is a matter of importance, the small size of the rotary compressor will be appreciated.

Climbing Bye-Pass Cock—in Off Position, with Torch Engaging for Turning On.

Climbing Bye-Pass Lighting the Burner.

Cock full on, Burner Lighted, and Bye-Pass Off.

Lighting Torch, with Protection Cap Removed.

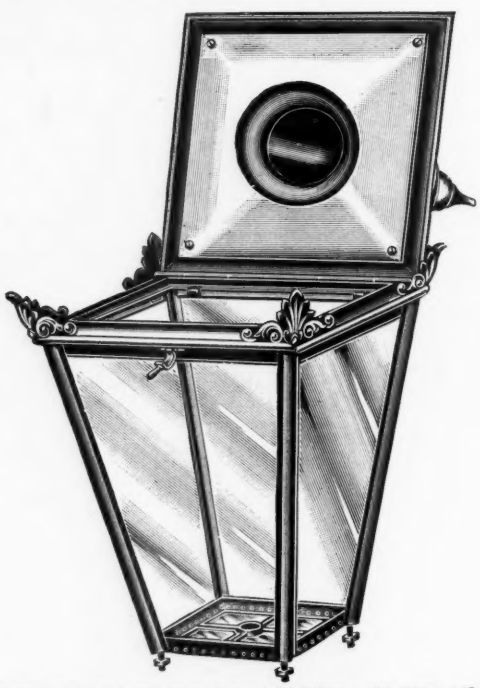
Supplementing the large variety of fittings the Company have specially devised for high-pressure lighting, is a 75-candle power reflector fitting, as in the annexed illustration. The suitability of this fitting for factory and workshop purposes is obvious. It is furnished with an air-adjuster and dust-protector, a clear glass mantle protector of heat-resisting quality, a 10½-inch enamelled steel reflector and cowl, and an anti-vibrator made under license of the A.V.I.L. Company. The consumption of gas is from 2 to 3 cubic feet per hour; and the efficiency is 30 candles per cubic foot. Unless otherwise instructed, nipples passing 2½ cubic feet are supplied—the illuminating power thus being 75 candles.

75-Candle Power Reflector Fittings.

The Keith patent flashing bye-pass cocks and electric lighter cocks are old friends; but this season the Company have a climbing bye-pass cock (illustrated), which does not require a pilot light, and overcomes the difficulty raised in some cases by the Insurance Companies. All that is required for each burner is the fitting; and a torch, in the hands of the man responsible for the lighting and extinguishing of the burners in large premises, does the rest. Description is unnecessary, in view of the illustrations. One advantage of this system of lighting, in places where a torch or taper must be used, is the preservation of mantles and the prevention of the smoking of the glasses and reflectors. The torch applied in the manner illustrated ignites the gas at one operation.

Messrs. Silcock and Tongue.

In connection with street lamps for incandescent gas lighting, Messrs. Silcock and Tongue claim that they have produced a lantern that is "far in front of anything yet put on the market." It is, in fact, quite the latest thing; being made of copper with a

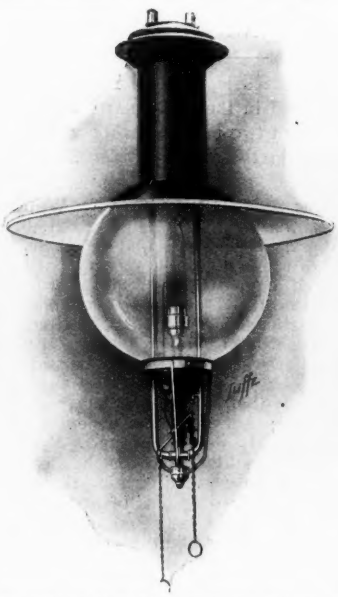


A Street Lantern for Incandescent Lighting, with Hinged Top for Cleaning, &c.

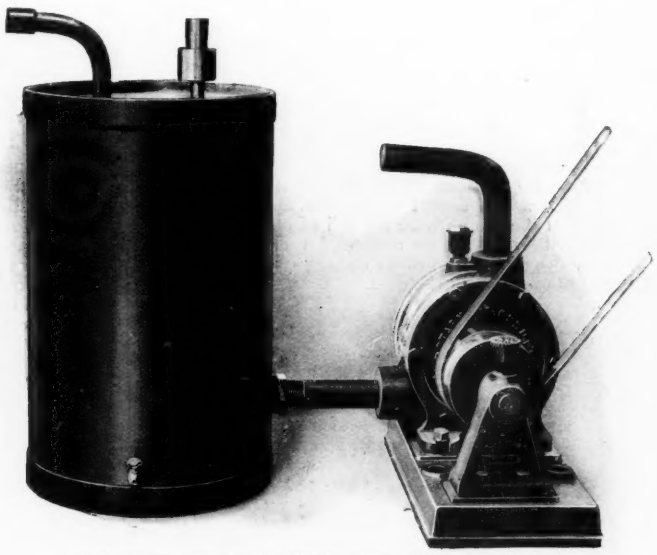
copper dome top, windproof head, and convex porcelain reflector inside, which throws all the light down. The top part is hinged, and opens straight back for cleaning, for getting at the burners, &c., and is fastened on to the front top bead with a neat thumb clip, as shown—thus doing away with the ordinary side door, and preventing a direct draught on to the mantles when cleaning. A quarter of the bottom of the lamp is a trap door for lighting.

United Kingdom Lighting Trust, Limited.

Some time since we published in the "JOURNAL" a complete description of the high-pressure lighting system of the United Kingdom Lighting Trust, Limited. In this case, it is the air and



Dust-Proof U.K. High-Pressure 500-Candle Power Lamp.



U.K. Blower, attached to Air-Reservoir, fitted with Governor.

not the gas that is compressed. The chief novelty that the Company have introduced for the present lighting season is a new lamp for dusty places, so arranged that none of the ordinary atmospheric air can enter it. Their system of high-pressure lighting peculiarly adapts itself for such a lamp, as it is only necessary to tap the compressed-air main which feeds the bunsen, and introduce a small pipe into the globe of the lamp. By this means, the compressed air is conveyed to the burner direct from the compressor, which may be situated at any convenient distance away. The lamp has been tested in foundries, mills, and every place that could be thought of where there is a large amount of dust in the atmosphere; and we are informed that it has given notable results in every case.

The next improvement is a 90-candle power inverted burner, which consumes only 3 cubic feet of gas per hour, and has been specially designed for use in mills or machine-shops where a number of small units are required. A further feature this season is that the Company's system has been adapted for use with a blower, to be run from ordinary shafting, hot-air engine, or electric motor, in places where a large number of lamps are required. The Company have also adapted the compressed-air system for heating—to laundry irons, laundry rollers, enamelling stoves, gas-stoves, &c.; and in many cases, we are assured, they make a saving of as much as 42 per cent. of the gas previously used to obtain the same heat.

[Other notices will appear in subsequent issues.]

A BUTTRESSED CONCRETE DAM.

The Beacon reservoir, part of a gravity system of water supply, is situated just above West Point (N.Y.), but on the opposite side of the river, on Mount Beacon, some 1200 feet above the high-water level of the Hudson River, immediately behind the village of Matteawan. It was built for storing and furnishing a portion of the water supply for Matteawan, Fishkill-on-the-Hudson, the New York State Hospital at that place, and some important manufacturing establishments. A storage reservoir is, of course, calculated to equalize the run-off from the watershed and the variations in the quantity of water flowing in the stream, so as to produce, as far as practicable, a sufficient supply the year through. The capacity of a storage reservoir, to be completely efficient when situated on a moderate or small stream, should amount to the daily consumption multiplied by the probable number of summer and autumn days during which the stream will be practically dry, or at least very much lower than the needed supply calls for—that is, during the hot months of August and September certainly, and perhaps during July and October as well—so as to provide against the actual use and waste of water, besides the evaporation and whatever, if any, unavoidable leakages there may be from the reservoir itself and its conduits.

Moreover, the matter of spillway, where the heavy rush of storm water is far above the ordinary flow of the stream, needs careful attention; and, though the average rainfall per annum for the part of New York State under consideration is only about 48 inches, it will be necessary, for safety, to provide spillway capacity for an impounding reservoir sufficient for the easy accommodation of the greatest quantity of water possible to reach such a spillway at any time. This necessity was dramatically illustrated in a rather startling manner a few years ago at this dam, when, in its form of construction previous to its present rebuilding and enlargement, the entire length was overtopped by a flood of storm water from an extremely heavy thunder shower, commonly called a cloud burst. In the reconstruction and increase in the height just finished, the new spillway was calculated for the heaviest known rainfall upon the watershed, was doubled in length, and was made about four times as deep as before; so that in all probability the area of watershed available will be fully accommodated under the most extreme circumstances of storm water and run-off.

The watershed of the Beacon reservoir, on account of its lofty situation, is of so moderate an area that there is a limit to the profitable dimensions of the dam; but from the short and rapid run-off, the rock nature of the watershed surface, &c., it is no doubt safe to calculate upon 65 per cent. of the rainfall as available for collection in the reservoir. The water falling as rain upon the surface of the reservoir to the amount of 100 per cent. would not quite cover the evaporation for a low year, and the low year with corrected evaporation will yield a storage of 103 million gallons. For the average year there will be a yield of 134 million gallons from the watershed, and about 2 million gallons over and above the evaporation from the surface of the reservoir—making 136 million gallons of water available for an average year.

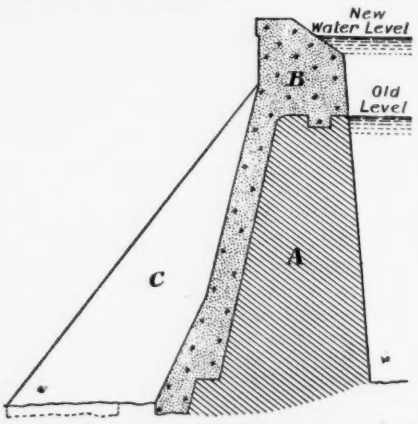
The above figures indicate that the original height of the dam, which was 23 feet above the bed of the stream, was about 6 inches higher than was actually necessary for the lowest record of rainfall, was more than 4 feet too low for the collection due to the average record of rainfall, and could be filled, if it was 12 feet higher than it was originally built, at the high record rainfall of 63·51 inches in the year 1888. The Beacon is a reserve supply calculated to fill between November and the following July, against the time when the other gravity supplies of the system fail in the summer months; and it must be considered that it is not necessarily emptied every year. Therefore the dam could be higher than the figures actually indicate for a complete filling, especially as a wet season preceding and succeeding a dry one would give a larger storage than the average; and with even two dry seasons successively, a very large storage at the start would be of great advantage.

Considering all the facts, it was deemed good judgment, in concluding how much higher it would pay to build the dam for the accommodation of this rather limited watershed, to take advantage of the average rainfall in excess of 48 inches (this being the average for 33 years) as a basis for calculation; and it was found to amount to 54 inches. Then allowing for evaporation, it was determined that the dam could be raised 7 feet—giving a total storage of 186 million gallons, including the new slopes to be covered by the rise of the water level. Therefore the plans and specifications were prepared for an increase of 7 feet above the original height of the crest, and made of sufficient resisting power to permit of still further height being obtained in case it was found that the run-off from this unusually rocky and impervious watershed proved to be a still greater percentage of the rainfall than had been allowed for.

The diagram on next page (which, with the descriptive particulars, has been taken from "Engineering Record") shows in the diagonal shading A, the typical or full section of the original dam, built of trap-stone quarried near the site. The portion B of the figure, indicating concrete, shows the addition to the dam in its fullest section, and also an outline, C, of the buttresses. It will be noted that there is a groove or dovetail cut into the top surface of the original dam, to provide a cut-off for the water, and also

to completely lock the old and new work together; also that the outer edge of the older dam is rounded, to add strength to the concrete jacket at this point.

The original stone dam was built probably more than twenty years ago, and was located upon a solid rock foundation bed, the rock extending well up the slopes at the ends of the dam—in fact, to a sufficient height for the safe support of the new work. The original spillway was simply a shallow notch of very moderate length formed through the crest of the dam near the middle of the length, and permitted the outflow to fall from the top to the bottom of the dam at its greatest height of section. The spillway for the new work is of liberal dimensions, and is situated at the easterly end of the dam, where the fall of outcoming water is comparatively little, and where a natural rock bed forms an excellent passage-way for storm water coming over the spillway down to the stream bed below the dam.



The new concrete structure is about 350 feet long and 33 feet high at its greatest depth of section; the depth of the water immediately behind the dam being about 30 feet. The peculiar buttress design was suggested naturally enough by the extremely high cost of material delivered on such an out-of-the-way site. The prime object was to reduce the amount of materials to the lowest terms; the labour, being quartered upon the premises, being scarcely above normal. Materials such as cement, sand, crushed stone, and lumber, at the ordinary points of rail and water delivery, were reasonable enough in price; but transportation to the site was nothing less than heroic in character, and brought up considerably the cost of these materials.

In round numbers, the total of the estimate was $23,000, and the contract was let for about 7 per cent. less. The estimate was made in the spring of 1904, just after prices of all kinds of materials had begun to fall. They have gone much higher since that time; but even at present prices the cost above given would probably be safe. Considering the difficulties of transportation up a grade of 1200 feet within two miles, the contract price for the work was considered quite satisfactory—to the buyers at least. A part of the saving on the cost of the dam was probably due to the fact that the successful bidder calculated upon taking a stone crusher up to the work, which he did; and as the trap rock was obtained upon the premises without any cost to him, he also saved the cartage upon a good many tons of material, bearing only the small expense of operating the crusher.

The Late Mr. Henry Finlay's Estate.

The late Mr. Henry Finlay, who was, until the amalgamation with the South Metropolitan Gas Company, Engineer of the Surrey Consumers' Gas Company, and whose death was recorded in the "JOURNAL" for the 27th ult. (p. 564), left estate valued at £212,583 gross, with net personalty £212,343. The Executors of the will are Mr. William Franklin Gardner, retired bank manager; Mr. Richard Laurence Andrews, of the London City and Midland Bank, Cornhill, E.C.; Mr. Frederick Robinson, accountant; and Mr. Francis Charles Collingwood, of 4, St. Dunstan's Alley, E.C., cashier, to each of whom the testator left £1000. He left all his shares in the London City and Midland Bank to Mr. Andrews, £2000 stock of the South Metropolitan Gas Company and five shares in the Hope Lighterage Company, Limited, to Mr. Robinson; to Mr. Frederick William Church, Secretary, Mr. John Gow, head foreman, and Mr. Thomas L. Archer, 25 shares each in the Gas-Meter Company; to each clerk in the same Company at the Kingsland Road branch the testator left £10; to Richard Rapkin, the Manager of the Hope Lighterage Company, Limited, £100; and £300 for distribution among the counter cashiers and coupon clerks at the Cornhill branch of the London City and Midland Bank. Mr. Finlay gave £1000, 50 preference shares in the Gas-Meter Company, and enough furniture to furnish two rooms, to his cook, Ann Smith, if in his service at the time of his death. He also bequeathed £1000 to the National Lifeboat Institution, for the purpose of building a new boat to be called the "Henry Finlay," to be stationed on the south-west coast of Scotland; and £500 each to 22 hospitals and other charitable institutions. The testator left the residue of his estate to Mr. R. L. Andrews and his wife, absolutely.

WATER SOFTENING AND HARDENING.

In the notice of the proceedings at the Fourth Engineering Conference which appeared in the "JOURNAL" for the 25th of June, it was mentioned that two papers dealing with the above subjects were submitted in the Water-Works, Sewerage, and Gas-Works Section.

The paper on "Water Softening" was by Mr. William Matthews, of Southampton, who began by pointing out that water for domestic purposes can, by the use of lime alone, only be softened to the extent of reducing the temporary hardness due to carbonates of lime and magnesia; the removal of permanent hardness requiring the use of other and objectionable reagents. The reduction of the carbonate of magnesia is attended with additional cost, as the quantity of lime used is greater; and, the chemical reaction being slower, the plant has to be laid out upon more liberal lines.

The author went on to say that the problem involved in softening *per se* is purely chemical; that of the subsequent clarification being mechanical and largely dependent upon the physical character of the precipitate resulting from the chemical process. To obtain the best results, the crystals forming the precipitate must be as large and regular sized as possible, to ensure which the lime water must be completely saturated and free from all suspended and undissolved particles, and the water to be softened must be equally clear and free from inert insoluble matter. The mixing must be in proper and unvarying proportions, and accomplished in such a way that, as far as practicable, each particle of water receives its individual dose of lime water. If the admixture takes place in tanks containing the precipitate thrown down in previous operations, the reaction between the lime water and the hard water cannot but be imperfect and unduly delayed; while the expenditure for lime is increased and larger tank capacity is necessary.

Ordinary builders' lime is useless for softening purposes; it must be hard-burned and practically free from alumina or siliceous matter. The lime obtained from chalk of at all a marly character must be studiously avoided, or the solution obtained will be found to contain a large percentage of hydrate of alumina in place of lime, and will lead to disastrous results.

After hydration, it is desirable, in anticipation of subsequent stages in the process, to convert the lime into the form known as cream of lime, by adding softened water in a standard proportion, passing it through strainers, and thus removing all the grit and *débris*.

The most approved way in which to create the lime water is to pass a stream of softened water through a tank or tanks into which cream of lime has been introduced; the flow through them being confined to so low a velocity that the water has ample time in which to become saturated with the lime, and does not carry up with the current any insoluble matter. By the adoption of this method, the regulation of the flow of lime water in the proper ratio to that of the hard water is rendered easy if two pumps be actuated by the same or each engine—the one pumping hard water and the other the softened water to be saturated with lime—as, no matter what variation in speed takes place, the ratio remains unaltered.

The mixture is best accomplished by allowing the lime water to fall in a thin sheet upon a similar sheet of hard water flowing under it. Between the operation of mixing and the commencement of the process of clarification there should be a time-interval varying from at least half-an-hour to a longer period, according to the amount of carbonate of magnesia in the water.

There can be no doubt that clarification can, in most cases, be best effected by filtration, as the plant required takes up a minimum amount of room, can be worked continuously, and be added to from time to time by small units, and is economical, while giving the best results.

The filtrate is formed in the first instance by allowing the softened water to pass through cotton cloth mounted on suitable perforated frames. The cloth arrests the crystals of the carbonates, which, becoming piled together, form a fine screen and filtering medium; hence the importance to be attached to their size and regularity. Upon the layer of precipitate reaching a certain thickness and the flow becoming correspondingly slow, the mass is washed off by means of water-jets and the filter started again.

To obtain good results, the head of water on the filters must be kept low and regular, and the outlets free, so that the cloths are not subjected to pulsating movement, such as that due to direct connection with a pump suction. The cleansing is best done by water-spray, arranged so that the jets, in passing across the cloth, pare the film of precipitate off them, and do not tend to drive the deposit into the pores of the cloth, as was the case in some of the earlier plants.

In conclusion, Mr. Matthews remarked that one of the great merits of the filtration system, when worked at a head which cannot be exceeded, is that by no manner of manipulation can the plant be made to pass more than its proper quantity of water, which must all be sent through the filters, and so be clarified. If the water is properly softened, and the necessary time-interval given for the completion of the reaction, there is no difficulty in filtration or danger of the subsequent formation and deposition of

precipitate in the pipes beyond the filters. But neglect of these precautions has given rise to much trouble and disappointment. In a notable case, where magnesia was present in rather large quantities, the blocking-up of the cloths became very serious, and was, in the author's opinion, due to the fact that, when the precipitate reached the filters, carbonate of lime crystals were deposited in the ordinary manner. Owing, however, to an insufficient time-interval after mixing, the reaction with the carbonate of magnesia was incomplete and still going on while the water was passing through the layer of deposit already on the filter-cloth; the effect being that the smaller crystals of magnesia were deposited among the larger crystals of lime, as well as in the pores of the cloth, filling up the interstices much in the same way as sand is used with gravel for making concrete.

The paper on "Water Hardening" was by Mr. James Watson, the Water Engineer to the Bradford Corporation. Having offered a few remarks on the well-known Clark system of softening water, the author said that water hardening—the antipodes of water softening—is a comparatively modern practice. In the softening process we apply lime to get rid of lime; in the hardening process we follow generally the same method by adding lime to waters in which lime salts are either wanting or are only found in abnormally small quantities.

Soft-water supplies are absolutely essential to the industrial life of many of our great centres of population, and probably no less so in securing the comfort and economy obtained from its use in the houses and homes of the people. Soft water has, however, under certain circumstances, one drawback—viz., it possesses lead-dissolving properties, and plumbo-solvency is far from uncommon as the result of its distribution. Such a state of matters was admittedly more or less dangerous to health, and the realization of this fact may be said to have been the initial cause of hardening water in order to counteract acidity and neutralize peaty water possessed of the lead-dissolving property.

In the Thornton Moor drainage area of the Bradford Corporation, a good deal of the land is of a peaty and boggy nature; and about seventeen years ago it was found that at times, especially after a flood, the water was acid, and acted on lead. The reservoir contains 175 million gallons, has a top-water level of 1241 feet above the sea, and is supplied from a high moorland drainage area 1260 acres in extent. The geological formation is millstone grit. The rains saturate the peat, and the water in the reservoir is often found to be acid.

The following analysis, made in the early days of hardening—viz., in 1892—shows the character of the untreated and treated water. The samples were treated with the view to determine the change made in the natural water by the method adopted (which had been in operation for some time) for remedying the solvent action on lead pipes, and to ascertain to what extent the character of the water was altered by "hardening." The results are given in grains per gallon. The reservoir water was found to have an acid reaction equal to 0·1 grain of sulphuric acid per gallon.

—	1	2	3	4
Total solid matter .	5·8	7·00	7·40	6·80
Lime (CaO) . . .	0·9	1·23	1·20	1·23
Hardness	1·5	2·30	2·40	2·30
Lime equal CaO (carbonate of lime).	1·6	2·20	2·22	2·20

1. Natural water from reservoir, untreated. 2. Water after treatment by adding 3 grains of carbonate of lime per gallon. 3. Treated water taken from the surface of one of the filter-beds. 4. Treated water after filtration through sand.

Many samples of water from the same supply, untreated and treated with chalk, were kept in contact with bright lead, and gave the following results:—

—	A	B	C	D
Grains of lead per gallon .	0·27	None	0·30	0·03
Days of contact	63	100	62	62

Samples A and C were untreated; samples B and D were treated.

Many experiments were made to ascertain the saturating-point; and it was found to be 3 grains per gallon. As a rule, less than this quantity did not show satisfactory results, and double had no better effect. The addition of 3 grains of chalk per gallon, applied with regularity and precision by the machine hereafter described, had the effect of preventing the lead-dissolving action of this water; and complaints as to water containing lead have been absent from this zone of supply for the past sixteen years.

The chalk used for hardening water is prepared in the following manner: The limestone is obtained from the quarry by blasting the rock, which is then sent to the mills, and there broken by hand into cubes of about 3 inches. These are shovelled into the wash-mill, which contains two heavy edge-runners to crush the chalk—a continuous supply of water being added in the grinding process. The resultant combination of lime and water is then passed into sand-pits, which collect the coarsest of the material, from which it is levigated into settling-tanks placed behind each other, and connected so that the material passes from one to the other over a series of five or six pits. The first pit receives the larger deposit, the second a smaller deposit, the third smaller still in deposit and finer in quality, and so on throughout the whole of its travel from the first to the last pit. When removed from the pits, it is taken to the ovens to dry. This requires 20 to 24 hours, after which it is ready for use. The finer and the richer in pure carbonate of lime the material is, the better is it suited for the hardening of water for water-works purposes.

The machine previously referred to is housed on the floor above the chalk-store. The chalk is conveyed by rope and pulley to the hopper, which holds a quantity equal to 12 hours' supply of the largest quantity of water to be treated; and when working at the maximum, it is filled every morning and night, beyond which no further attention is needed. The chalk passes from the hoppers to the rollers of the mill, passing through the rollers in a fine film or sheet of powder into the mixing-churn, where a revolving-shaft, with agitator arms attached, makes milk of lime, which in turn is delivered into a trough, where it mixes with the untreated water. The treated water is then conveyed by the filter-bed canal to the filter-beds, and passed through the sand filters at the rate of 380 to 400 gallons per square yard of filter area per day. The machine is driven by a small water-wheel, the feed of which can be regulated within limits to a constant speed of revolution. This, in turn, operates the rollers and the agitator, which can be set and kept at any desired speed. The upper roller can be set at any distance apart from the under one, the aperture being regulated by screws; and any number of grains per gallon can be sent to the untreated water by adjustment of the rollers, which when once set remain constant and regular in the delivery of chalk.

The works have been in operation night and day for sixteen years, require practically no attention, and are serving, and have served, the purpose for which they were erected—viz., to harden an exceedingly pure and soft water. The machine described was the first of its kind to be used for the accurate application of lime for the hardening of water.

Use of Tar Oils in the Diesel Motor.

A recent number of the "Zeitschrift des Vereins Deutscher Ingenieure" contains a report by Herr P. Rieppel, of Nuremberg, on some experiments on the use of tar oils for driving motors of the Diesel type, which were carried out in various commercial laboratories in Germany as well as at the Technical High School in Berlin. From the results then obtained, it would appear that: (1) Brown coal-tar oils can be used in the Diesel motor; but ordinary coal tar oils can only be employed after suitable treatment. (2) No useful information as to the value of an oil for the purpose in view can be obtained by ascertaining its specific gravity, viscosity, flash point, firing point, or calorific value. (3) On the other hand, a determination of the proportion of hydrogen by ultimate analysis is of fundamental importance, as it enables the investigator to find out the quantities of aliphatic or aromatic hydrocarbons present. (4) Self-ignition and combustion are the more likely to occur, the more suitable the oil is for the production of oil gas—that is to say, the greater the volume of gas it yields at a comparatively low pressure and low temperature. Ordinary tar oils require a larger amount of heat to be impressed on them, or a longer gasification period, than brown coal tar oils. (5) It may be considered that all motors consuming liquid fuel can be divided into two kinds. The first of these—*e.g.*, the Diesel and the Haselwander—are distinguished by the fact that the oil is sprayed in when the engine reaches its dead-centre, oil gas being formed at once and no method of artificial ignition being employed; the second are the true explosion motors, where a mixture of oil vapour and air is inflamed by artificial means without intermediate production of oil gas. The latter definition shows the way in which anthracene and creosote oils may be rendered utilizable in the Diesel motor. The plan requisite consists in powerfully heating (perhaps only at one spot) the space in which the compression occurs—that is, in imitating the conditions of the explosion engine proper. A Diesel engine run on these lines has worked for weeks at a time on a cheap tar oil in a factory at Nuremberg, and borne variations in the load, from zero to full power, without giving any trouble.

A gas-engine test lasting two weeks was recently run at the works of the J. P. Eustis Manufacturing Company, of Boston, by Messrs. P. R. Nichols and R. F. Knight, of the Massachusetts Institute of Technology. The test was made on a 55 H.P. engine direct-connected to a 30-kilowatt direct-current generator. The engine was of the vertical twin-cylinder four-cycle type, the governing being effected by varying the richness of the explosive mixture. Cooling water was circulated by a motor-driven centrifugal pump; and the engine was started by compressed air stored in two tanks, which were kept filled by an air-pump driven by a small motor. The gas used by the engine was taken from the street mains, and averaged about 590 B.Th.U. per cubic foot. During the two weeks' run, the total kilowatt-hours were 3146, and the total gas used was 92,900 cubic feet; 31·9 kilowatt-hours were used in driving the pump, leaving 3114 as the net energy delivered during the run. At 70 c. per 1000 cubic feet, the gas cost 2·09 c. per kilowatt-hour; the oil, 0·029 c.; the labour, at two hours per day, 0·193 c.; and the interest and depreciation, reckoned at 15 per cent. on $3000, amounted to 0·555 c.—making the total cost of energy 2·87 c. per kilowatt-hour.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Gas-Heating Business Field.

SIR,—The article in your issue of the 3rd inst., emphasizing the desirability of the extended use of gas-fires, tends to make the subject a prominent one. As you suggest that readers may have something to say upon the subject, it has occurred to me to venture a few remarks thereon.

It may seem somewhat ungracious to take exception to your statement that the methods adopted by municipal undertakings have not provoked your admiration. At the same time, the methods advocated by you have been in some cases already in use by municipal undertakings for many years.

You advocate differential prices for lighting and heating; but my Committee have for a great many years adopted this. They have also continuously advertised gas-stoves enormously; assisted at lectures and demonstrations on gas cooking and heating; and have spacious show-rooms available at the gas-works and in the centre of the town. At the present time the price for lighting is 2s. 3d. per 1000 cubic feet and for heating 1s. 6d.—both subject to 5 per cent. discount. Surely a difference of 9d. would be thought sufficient. All gas fires and meters are fixed free of charge to the consumer at a trifling rental for whatever pattern gas-fire is selected. Yet, with all this enterprise, the fact remains that there has not been any extensive adoption of gas-fires in the town.

One is lead to inquire what are the principal causes of the non-adoption of gas-fires upon an extended scale. It is known that the medical profession are frequently unfavourable to their use. This opposition can only be overcome by education and experience upon this point, and will adjust itself.

The assistance of architects is much needed, in order that adequate provision for gas-fires may be made in new buildings. In some bedrooms, miserable little register stoves are found—unsuitable for any purpose; and the addition of a gas-fire projecting in front of the grate is not an improvement. If a suitable recess had been made, and pipes laid in the first instance, the case would be altogether different. The projection of a gas-fire into many small rooms, coming into close proximity to the bedstead, is undesirable.

Gas-fires ought not to be made simply as a correction or an addition to a coal-fire register, but ought to be arranged for in the original design. It looks objectionable for a gas-fire to be placed in front of a coal-fire grate.

A modern grate adapted for a gas-fire in the first instance would do much to popularize the use of gas for heating in drawing-rooms, &c.

The principal hindrance has hitherto been the inefficient design of gas-fires available, and not from lack of commercial enterprise in the matter. When a really efficient and economical gas-fire is available, the development of the heating business will speedily follow.

EDWARD A. HARMAN.

Huddersfield, Sept. 11, 1907.

SIR,—It was with great pleasure I read your editorial and the letters from Mr. R. G. Shadbolt and others dealing with the above subject; and I most heartily endorse the points raised.

It has long been a matter of wonder to me why the gas companies in this country, in these days of fierce electric and power gas competition, have not made an energetic bid for the vast field awaiting development in the matter of gas heating. Whatever might have been urged years ago in favour of being gas lighting companies only—to which so many names testify—these arguments certainly do not hold good now, and will hold less and less as the years go by. The period of a more or less beneficent monopoly has gone; and the days of low illuminating power, cheap gas, and commercial methods have come. And well will it be for those who have the foresight to read the signs of the times, and to act in accordance. It is a matter for general comment that, while in the majority of houses there is now installed a gas-cooker, only in the minority is a gas-fire seen—and then possibly not more than a single one.

The commercial principle at stake in obtaining a footing against competitors, is to be able to give a better article than any previously in use. This has been well exemplified in the case of the cooker; and upon it, it solely has made its triumphant way. The (1) convenience, (2) saving in labour, and (3) general economy of the cooker are most obvious to all; and if the field of heating is to be attacked, the same principle must be observed. The gas-fire possesses, in common with the cooker, the first two essentials. That it has failed on the third is, however, common knowledge; and the fact that many thousands of stoves are hired out during the winter season does not invalidate the point, inasmuch as they are promptly returned as soon as the circumstances that called them forth have passed—thus clearly inferring that they are of value only against exceptional conditions. If their appreciation and value were fundamentally sound, they would be retained, the same as the cooker and the gas-fittings.

The reason that the gas-fire fails on the third point, is that it has not yet been clearly recognized that it is a fuel consumer pure and simple, and as such has to compete with other fuel users, and therefore has nothing in common with lighting principles or practice. Until that is recognized in this country—and it is high time that it was—and means are taken to enable it to compete on a fair basis against other fuel-users, the field will remain practically unworked. But so soon as prices are adjusted, I am certainly of opinion that no difficulty will be experienced in greatly improving the financial position of gas undertakings.

The capital outlay on extra meters need not be seriously considered, as there are to-day specially-made small meters of a rotary type to meet the case, whose cost is so low as to prevent any anxiety on this point. As one officially connected with a large foreign gas company, I can speak most positively as to the benefits accruing, and accruing only to the system of differential prices of gas, coupled with the use of these small meters, applied to the purposes named; and I see nothing to prevent a similar success here. Treating a consumer's meter in the same manner as our electrical friends treat their watt meters, where is the gas manager who is content with the load-factor so exhibited?

COMMON SENSE.

Sept. 14, 1907.

SIR,—I beg of you to accept my best thanks for the reassuring article, on differential prices, which appeared in your issue of the 4th inst.

In common with many other investors in gas stocks, I was very uneasy some years ago when the electric light first made its appearance as a real competitor with coal gas. But thanks to the able and vigorous speeches of the Chairman of the South Metropolitan Gas Company, *re* the customers of the artisan class which would be added to the then customers, by the adoption of the prepayment system, I fortunately held my hand from selling out.

Again the time appears to have arrived when a new stimulus is required for the continued success of the gas industry; and as foreshadowed by your article, and by the speech of Mr. Whiteley, the Chairman of the Bournemouth Gas Company, this field is in the direction of domestic heating.

STOCKHOLDER.

Sept. 10, 1907.

SIR,—I am a manufacturer of gas apparatus, an investor in gas stock, and use gas for both light, heat, and power.

Mr. Shadbolt's letter in your last issue puts in a nutshell the common-sense policy that should be adopted. It is not at all necessary in the majority of cases to tamper with the price of lighting gas; it is already cheap enough. It is not a question of whether the margin of profit allows it. But it is a question of competition; and if the heating field has to be obtained, I am of opinion that differential prices must be adopted to bring gaseous fuel nearer the price of solid fuel.

C. S.

Sept. 13, 1907.

SIR,—I am interested in gas companies, not only as a shareholder but as a consumer, and read with much satisfaction your article about the large scope there is for gas-fires.

My own case is simply typical of a great number of gas consumers. In every room in my house (except the general living-room and the day-nursery) a gas-fire is fixed; and there would be one in each of these rooms also if I could gauge with any degree of certainty how much gas I should be likely to use during the year, and if my gas company would encourage me to use them by either granting me a rebate, or charging me on a lower scale for the gas so used. Up to the present, however, the company do not seem to care whether I use coal fires or gas. The former, under present conditions, are cheaper than the latter for extended use—notwithstanding the dust and labour in connection with them. But perhaps, as the price of coal seems to be going to unknown heights, the gas company will wake up and offer some inducements to would-be users of gas-fires like myself.

A CONSUMER IN THE SOUTH.

Sept. 13, 1907.

Gas from Straw.

SIR,—I have read with much interest the paragraphs, *re* "Gas from Straw," in last and this week's issues of the "JOURNAL."

It brings back to my recollection making gas from megass (crushed sugar-cane) a good many years ago, when I was Engineer and Manager of the Georgetown Gas Company, Demerara, and at the time was acting as Consulting Engineer for three large sugar factories.

After the cane is crushed in the mills, a certain percentage of the juice is left in the cane, which with the fibre, produced a big make of gas of about 4-candle power. At that time the duty on oil was prohibitive, as Georgetown is a wooden-built city; and the duty was kept high, by pressure on the Government by the local Fire Insurance Companies.

Had it been possible for me to procure oil at a cheap enough rate, I would have gone further into the matter of making good saleable illuminating gas with megass and oil.

THOS. B. YOUNGER.

Chesterfield House, Great Tower Street, E.C.
Sept. 12, 1907.

Gas Explosion at Bideford.—An explosion which did considerable damage took place yesterday week at No. 6, Torridge Place, Bideford. Mrs. Mills, the wife of the occupier, discovered a smell of gas when she got up in the morning, and on going into the sitting-room on the ground floor appears to have struck a match. An explosion resulted, which blew out the windows, broke down part of the ceiling, and threw Mrs. Mills to the ground and burnt her severely. A second explosion immediately followed in the kitchen, where a gas-stove was lit. This also did considerable damage to the premises. It was discovered that the escape of gas was due to the evaporation of the water in the slide of a chandelier in the sitting-room.

Self-Intensifying Gas-Lamps for Indoor Lighting.—A new scheme of lighting has been carried out by the Exeter Gas Company at the Victoria Hall, one of the most popular places of assembly in the city. For the illumination of the large hall, 16 of the latest pattern Welsbach self-intensifying gas-lamps are used. These are each of 500-candle power, so that the total is equal to 8000 candles; while the distribution is so arranged that every part of the hall is brilliantly and evenly illuminated. The lamps for the ground floor and the stage are all suspended by steel wire, and the gas is supplied through flexible metallic tubes. They can thus be raised or lowered or moved to any desired position. One tap controls the stage lights, and two taps the ten central lamps; and the whole or part of them can be turned on or down simultaneously or in sections. Though the lighting is so greatly improved, the cost will be less than half what it was under the old system; and the gas consumed will come to just over 1s. per hour.

REGISTER OF PATENTS.

Cooling and Washing Gases.

MEYER, A., and HASTERT, E., of Dudelange, Duchy of Luxembourg.
No. 18,014; Aug. 10, 1906.

This is a modification of an invention recently described in the "JOURNAL"—see *ante*, p. 578; and the same illustration that was then reproduced accompanies the specification of this later patent.

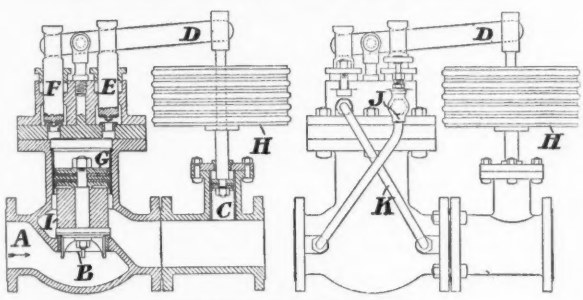
The apparatus referred to is characterized by the combination of a cylindrical vessel and a number of perforated plates or sieves for distributing the gas, which rotate on a horizontal shaft, and one or more series of perforated tubes arranged in such a manner that each plate is uniformly cooled by fresh water and each element of the sieve-surface is freed from dust by rotation.

In accordance with the present invention, the spraying of the sieves is effected by pairs of pipes arranged radially to the shaft, and provided with spraying holes in such a manner that the total surface of the sieves is completely sprayed by fresh water under pressure twice per revolution. In this manner, on the one hand uniform spraying is ensured, and on the other hand the particles of dust deposited by the gas upon the meshes are constantly carried away by the water; so that obstruction of the sieves is entirely prevented. As compared with known forms of apparatus, this apparatus is said to present the "important advantage that the total section is almost doubled, which corresponds to an increase of the output in the same proportion." Also as obstruction of the meshes is impossible, the employment of dismountable segments for the metal discs becomes superfluous.

Regulating Pressure in Pipes.

BROADHEAD, J. B., of Brighouse.
No. 18,460; Aug. 17, 1906.

This invention relates to that class of pressure regulators in which the movement of the valve controlling the pressure supply is itself controlled by the delivery pressure of the fluid acting upon a piston against the action of weights; and it is more particularly applicable to water-mains in towns where the pressure may vary considerably owing to difference in altitude. The apparatus is also applicable for controlling and regulating the pressure of steam or any fluid.



Broadhead's Pressure Regulator.

The inlet of the apparatus is at A; and when charging the main, the valve B opens by the pressure acting on the inlet side. The piston C is loaded with weights equal to the pressure on the outlet side; and when the desired reduced pressure on the outlet side is attained, the piston moves upwards, and lifts the lever D, which opens the valve E, and closes the valve F. The valve E being open, the pressure on the inlet side acts on the piston G—the water passing through the auxiliary pipe and valve J, which is always open except in case of fire. The weight I moves the valve and piston immediately the piston and valve are in equilibrium. The area of the piston G being larger than the area of the valve B, the pressure acting on the piston closes the valve; and it remains closed until such time as the pressure on the outlet side is reduced by a draw on the main.

When the pressure on the outlet side falls below the pressure for which the apparatus has been designed, the weights H overcome the pressure on the piston C, and the lever D falls and closes the valve E and opens the valve F. The main being now charged, the valve B is acted upon at both sides, but by different pressures. The pressure on the inlet side of the valve, combined with the reduced pressure acting on the underside of the piston G, opens the valve and displaces the water at the back of the piston through the valve F and pipe K into the outlet side of the main.

In case of fire, the valve J may be closed, which thus cuts off the supply of water from the inlet side to the top of the piston G—the initial pressure and full bore of valve being thus available for fire purposes.

Incandescent Gas-Mantles.

COXHEAD, G., of East Ham, Essex.
No. 18,602; Aug. 20, 1906.

This invention relates to gas mantles which have a catalytic material applied to them for the purpose of rendering them self-lighting upon the gas being turned on and which "obviate the many disadvantages generally experienced with the ordinary methods of lighting even when independent catalytic and other automatic igniting devices are made use of." The inventor claims that it is possible, from one given point, to control individually or collectively a whole series of burners, and thus permit of any or all the burners of a system being lighted or extinguished (or the light raised or lowered) at will.

He proposes to treat the mantle with the catalytic material during manufacture—that is to say, at the stage immediately following its impregnation with the illuminating salts he applies to a part of the mantle which will form one of the folds in the neck or gathered-in portion a strong solution of "a particularly active platinum black" which is then heated and dried and the process repeated. A thin line or streak of the platinum black is then drawn down the side of the mantle, extending from the spot treated as described to the ignition point of the gas, and the mantle is then finished off in the ordinary manner.

Gas Analysis Apparatus.

SIMMANCE, J. F., and ABADY, J., of Westminster.
No. 18,680; Aug. 21, 1906.

This invention relates to apparatus for enabling the volumetric analysis of a gas or gaseous mixture (with a view to the detection and estimation of certain constituents) to be performed by the well-known method of measuring off a definite quantity in a chamber of variable capacity, exposing same to the action of a suitable reagent, and re-measuring the residual gas also in a chamber of variable capacity—the difference between the volumes of gaseous mixture before and after the reaction affording a guide to the estimation (quantitative or qualitative or both) of the constituent sought.

Known forms of apparatus for effecting this operation, the patentees point out, comprise chambers of variable capacity (one of which is connected with the source of gas to be analyzed, while the other is connected with the first chamber and with an outlet) and means for subjecting the gas to the action of an absorbent reagent as it passes from the first to the second chamber. Moreover, it has been proposed to provide such apparatus with a venting device, for automatically limiting the pressure within the first chamber when the latter attains a predetermined effective capacity—consisting of a tube, one end of which is fixed to the first or measuring chamber, while the position of the other end is fixed in relation to a liquid seal which closes the end, so that the venting device is caused to act as such by the rise of liquid in the first chamber.

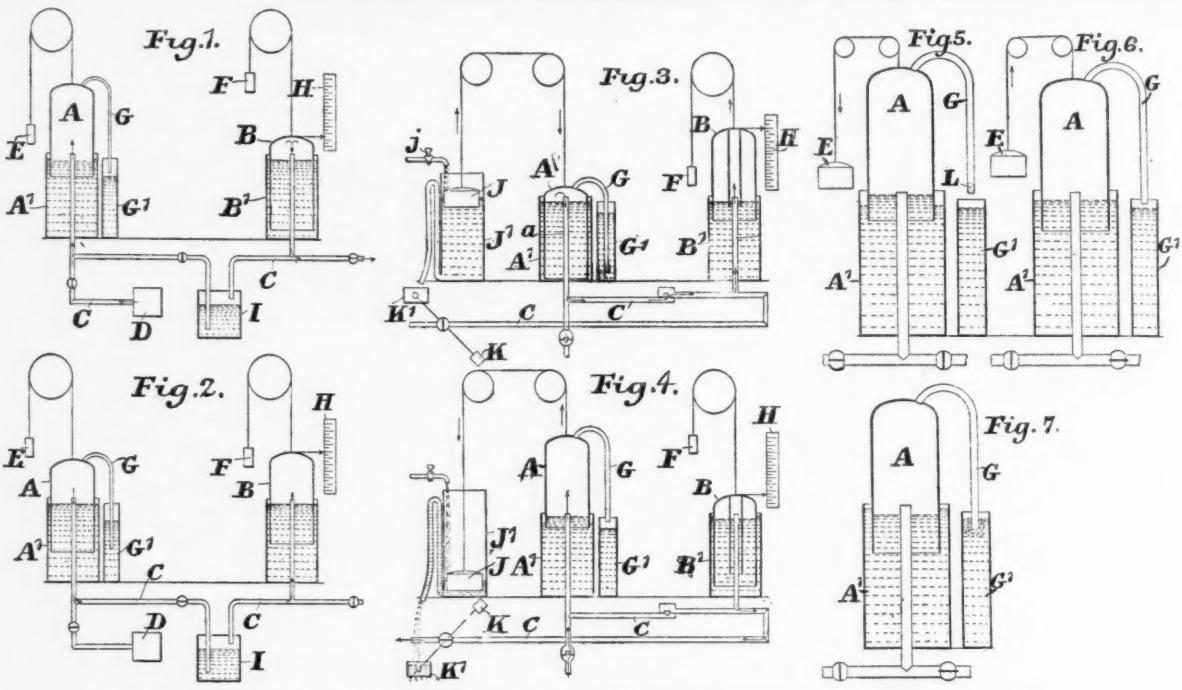
The more immediate object of the present invention is to provide (with a view to enabling the method just described to be carried out) apparatus of "extremely simple construction" provided with an improved device whereby a constant predetermined volume of the gas or gaseous mixture to be tested, whatever the pressure at which it reaches the apparatus, shall always and automatically be brought to a determined pressure—usually about that of the atmosphere—so that a series of volumetric tests, if performed under identical conditions as regards temperature, will yield results having a uniform degree of accuracy. A further object is to provide, in combination with the device just referred to, means for enabling the apparatus as a whole to be worked automatically.

The gas to be analyzed is first introduced into an expansible chamber in the form of a sealed bell provided with a venting device consisting of a tube communicating at one end with the crown of the bell, while the other or free extremity of the tube normally dips into a liquid seal whose surface level is adjustable, so that the pressure of the gaseous contents of the bell will be automatically limited when the bell attains a predetermined maximum effective capacity. The measured volume of gas at predetermined (usually about atmospheric) pressure, thus obtained, is thereafter passed, at approximately the same pressure, through apparatus wherein it is subjected to the action of an absorbent reagent; the residual gas which passes over from the reagent being received in, and causing a corresponding rise of, a second sealed bell provided with means for measuring the resulting increase in its effective capacity in terms of the volume originally introduced into the first bell.

The introduction of the gaseous charge into the first bell is effected by a pump actuated by hand or by some form of outside mechanical power—such as gear and weights, clockwork, chimney draught, water power, electricity, or the like. Thus, for example, the pump may be constituted by the first gas bell itself; this being caused to alternately rise and descend so as to alternately inhale and expel the measured volume of gas to be tested. The bell, in order that such movements may be performed automatically, may be connected to a float reciprocating vertically in a vessel which is alternately filled with liquid from a constant source of supply and emptied automatically by syphonage. The discharge of the syphon may serve also to operate a valve which controls the waste outlet of the second bell, so that the action of the apparatus as a whole is automatic.

Figs. 1 and 2 (p. 774) represent a rudimentary form of the apparatus at two stages of the operation. Figs. 3 and 4 show similar apparatus also at two stages of the testing operation, in combination with means whereby the rise and descent of the first gas bell, and the control of the apparatus as a whole, are effected automatically by syphonic action. Figs. 5, 6, and 7 show part of the apparatus of figs. 1 and 2 at three successive stages of the testing operation.

In figs. 1 and 2, A and B are expansible chambers constituted by the bells of two gasholders, each of (say) about 500 c.c. capacity; A being, however, slightly larger and heavier than B. The respective bells, which are immersed in liquid seals contained in tanks A^1 and B^1, are connected together in series, whereof A is the first. The tubes which enter the bells through the bottom of the respective tanks and serve alternately as inlets and outlets for the corresponding bells, are for this purpose branched upon a gas supply-pipe C which leads from a small hand pump D supplying the gaseous mixture to be tested and discharges to waste. The gas supply to the respective holders is controlled by three taps on the pipe C, the first tap being between the pump D and the branch leading to the first and larger bell A; the second between the two branches; and the third between the branch leading to the second and smaller bell B, and the waste outlet. The bells A and B are approximately counterbalanced by weights E and F attached to cords passing over pulleys. A vent-pipe G communicating with the interior of the bell A is attached rigidly to the latter—preferably at a point in the crown, and is downwardly bent so as to be adapted to be sealed in an independent vessel containing (say) glycerine, the surface of which stands lower, relatively to the mouth of the pipe G, than does the surface level of the liquid in A^1 relatively to the mouth of the bell A, so that when the bell stands at about its



Simmance and Abady's Gas Analysis Apparatus.

highest level, the mouth of the pipe G may be unsealed. Attached to (or operated by) the bell B is a pointer adapted to work over a scale H divided into 100 equal parts; the zero and highest points of the scale being indicated by the pointer when the bell is near the lowest and highest points of its vertical movement respectively.

Whereas the liquids in A^1 and G^1 should be inert relatively to the gas, or ingredients of the gaseous mixture to be tested, the liquid in B^1 may be a solution of the reagent employed in making the test. A convenient means of ensuring intimate contact between the reagent and the gas entering the bell B is (see figs. 3 and 4) a tube of metal gauze attached at top to the bell B and adapted to work freely over the centre pipe being of approximately the same length as the bell, so that each time the bell rises in consequence of gas entering, a film of the reagent will be carried up by and spread over the gauze tube, through whose meshes the gas as it enters is compelled to pass.

With the apparatus described, the testing operation is performed as follows: The tap separating the bells A and B having been closed, the gaseous mixture to be tested is forced by the pump D into the bell A until the latter rises so far as to lift the vent-pipe G high enough in the vessel G^1 to permit a portion of the gas to bubble through the sealing liquid therein—the bell A, however, always remaining sealed in the tank A^1. While the gas is still bubbling through the sealing liquid in G^1, the tap below A is closed and the pump D stopped, whereupon the bell A sinks by its own weight, driving the vent-pipe G lower in its vessel G^1 until the escape of gas through this pipe ceases, when the bell will remain stationary. Obviously, this condition of equilibrium will be reached, the patentees remark, when the depth of the seal corresponds to the weight of the bell; and inasmuch as this weight is constant, the position of the bell at which equilibrium is attained will also be constant, and the bell will always measure off an equal quantity of gas, whose volume may be determined by adjusting the level of the liquid in the vessel G^1.

The tap below A being thus closed, as is also the outlet tap, the tap separating the bells A and B is opened, with the result that the bell B which is lighter than A, will be charged with gas from A as the latter descends; the reagent in the tank B^1 or washbottle I meanwhile absorbing any constituents of the gaseous mixture upon which it is adapted to act. Thus the volume which enters the bell B will be correspondingly less than that which is expelled from the bell A. The difference will be expressed upon the scale H as a percentage of the volume originally contained in the bell A—the scale having been previously so graduated and adjusted that a rise of the pointer from zero to 100 on the scale will correspond exactly with a full and unaltered volume of gas in the bell A. Hence the indication made by the pointer will always shew, directly, the precise proportion of the gas or gaseous mixture absorbed by the reagent.

Instead of using a force pump to inject gas into the bell A, the latter might itself be made to serve as a suction pump; an arrangement for this purpose being illustrated in figs. 3 and 4 in combination with devices whereby the action of the apparatus is rendered entirely automatic. For the weight E, fig. 1, whereby the bell A is approximately counterbalanced, is substituted a float J adapted to rise and fall within an open-topped vessel J^1; the weight of the float, when unsupported by liquid in the vessel J^1, being sufficient to raise the bell A so as to cause the latter to inhale a charge of gas. A stream of water is allowed to trickle constantly into the vessel J^1 through a pipe controlled by a tap, while there is a syphon tube connected with the vessel and adapted to rapidly empty it on the water therein rising somewhat higher than is required to raise the float J so far as to allow of the bell A descending to the full extent of its adjusted travel. Two of the taps referred to above are replaced by automatically acting non-return suction and delivery valves as indicated, while the third tap, which is normally held closed by means of a weight K attached to one arm of a lever fast on the spindle of the tap-plug, is adapted to be opened temporarily by the weight K being overcome by that of the water discharged by the syphon tube into a cup K^1 mounted on the other arm of the lever. The cup K^1 has a perforated bottom to allow of the water which is periodically delivered into it escaping after the tap has been opened by the reversal of the lever as indicated in fig. 4.

The action of the apparatus is as follows: On the vessel J^1 being emptied, the float J, ceasing to be supported, will descend, and by so doing will draw up the bell A; the vacuum thus created in the latter being filled by gas drawn into the bell. The rate of flow of water is so adjusted that as soon as the bell A attains the highest point in its travel the float J will commence to rise, and will thereafter continue to ascend until the bell A has descended to the full extent of its adjusted travel. The bell A, by its descent, expels its gaseous contents into the bell B, the exit from which will meanwhile have been closed by the action of the weight K on the tap. The gas as it passes to the bell B will be acted upon by the reagent; and this bell will therefore rise to a height (as indicated by the pointer on the scale H) corresponding to the amount of absorption produced by the action of the reagent. After the bells A and B have completed their downward and upward travels respectively, the water in the vessel J^1 will rise to the summit of the syphon tube; and the syphon coming into operation, the water in J^1 will be rapidly discharged and, by temporarily weighting the cup K^1, will cause the tap to be opened, and so held, long enough to allow of the bell B (which in this arrangement is made heavier than its approximate counterweight F) descending and expelling its gaseous contents to waste. The emptying of the vessel J^1 will meanwhile, as first explained, have permitted the float J to descend; the entire cycle of operations thereupon recommencing and being repeated, as already described, so long as water continues to flow into the vessel J^1.

It is to be observed that though the methods of working described with reference to the arrangements illustrated in figs. 1 to 4 are identical both essentially and as regards the results obtained, they differ with respect to the conditions existing in the bell A during part of the operation. In other words, while in both cases the gas in bell A, before being allowed to pass from A to B, is always brought to the predetermined pressure (usually approximately atmospheric pressure) at which the test is to be actually made, the test pressure is arrived at from (so to speak) opposite sides in the two cases. Thus, in the case of figs. 1 and 2 (where the gas is injected into A under a pressure above that of the atmosphere) the test pressure is reached by reducing the pressure originally existing in the bell A, whereas in the case of figs. 3 and 4 (where the gas is drawn into A at a pressure below that of the atmosphere) the test pressure is arrived at by increasing the pressure originally existing in the bell A.

Now, under the conditions found in the arrangement shown in figs. 1 and 2, it is obvious that the necessary reduction in the pressure of the gas in the bell A is effected by the escape of a portion of the gas through the vent-pipe G on the bell rising above a certain level, as already described. Under the conditions found in the arrangement shown in figs. 3 and 4, however, the necessary increase in the pressure within the bell A results from the fact of the partial vacuum, created by the rise of the bell, becoming filled by the indraught of gas sucked into the bell. In both cases the pressure obtained within the bell A is determined by the depth of the liquid seal above the mouth of the vent-pipe G; and it is evident that, in order to conduct the test under actual atmospheric pressure, the bell A must be raised until the vent-pipe G is lifted, momentarily, clear of its seal. This cannot result, however, in the entry of air into the bell by way of the pipe G in either case.

In the case of figs. 1 and 2, the higher pressure within the bell will begin to escape through G before this pipe is lifted clear of its seal; and the moment equilibrium between the pressures inside and outside of the bell is attained (*i.e.*, immediately after the supply of gas is cut off), the bell will descend of its own accord and the tube G will become re-sealed. In the case of figs. 3 and 4, the partial vacuum created within the bell A as the latter is lifted may be filled with gas as

quickly as it is formed; but whether this be so or not, the ingress of air by way of the vent-pipe G, during such portion of the rise of the bell as takes place after the exposure of the mouth of the vent-pipe, will be prevented by the closure of the mouth of the pipe by a plug G (Fig. 5) of the liquid (*e g.* glycerine) which constitutes the seal. This plug L, which will be carried up along with the pipe G by atmospheric pressure, will remain in the pipe until the bell begins to descend, whereupon the pressure within the bell will increase to a degree even slightly above that of the atmosphere. It will be evident that during such increase in the internal pressure, no air can enter the bell by the pipe G, the period of equilibrium between the internal and external pressures (during which air might enter by diffusion owing to the liquid plug L then falling from the pipe, as indicated in fig. 6) being of momentary duration.

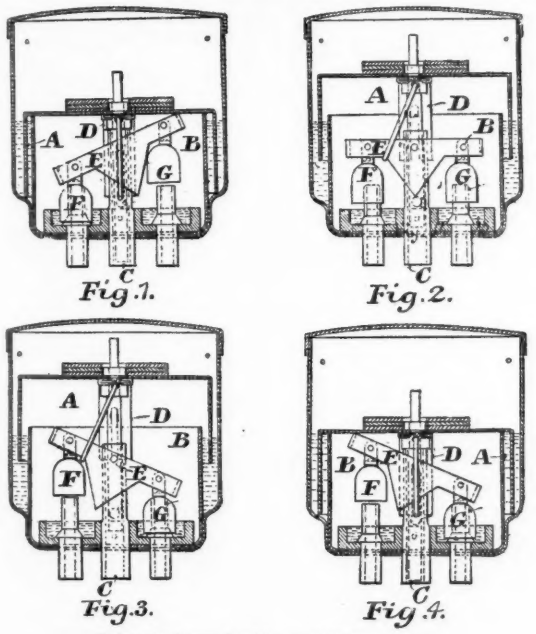
In order to ensure a uniform volume of gas being obtained in the bell A, the stroke of the latter must be of sufficient length to admit of the reversal of the conditions (as regards pressures respectively inside and outside the bell, as just described) taking place before the pipe G has descended so deeply in its seal as to prevent the escape of any surplus gas from within the bell, as indicated in fig. 7.

Lighting and Extinguishing Gas-Lights from a Distance.

ROBSON, G., of Sydney, New South Wales.
No. 19,225; Aug. 28, 1906.

This is an apparatus for lighting and extinguishing lamps from a distance by suddenly increasing or decreasing the pressure of gas in the mains. Pivoted yokes and mercury seals are used, with the object of providing for this purpose "a small simple and effective device without structural complications, which will be reliable in its action under all conditions obtainable in street gas-lighting practice."

The patentee employs a motor bell A which forms the roof of the gas chamber B. This bell is adapted to rise and fall on a vertical guide rod moved within a fixed tubular standard C secured to the bottom of the chamber. A bracket D (secured to the guide rod) carries a hanging link which alternately passes to the right and left of a spear point on a beam E each time the motor bell rises. Weights regulate the weight of the motor bell and determine the pressure at which the bell will rise.



Robson's Lamp Lighter and Extinguisher.

Fig. 1 shows the motor bell in its lowest position—that is to say, with the gas pressure in the main reduced to or below the engaging pressure. The gas passages to the main burner are closed by the small bell F which is immersed in its mercury seal while the bell G is raised clear—thus leaving the passages G to the pilot-burner open. Fig. 2 shows the motor bell partly raised and the oscillating beam E level; the small bells F G being unsealed, with the gas passing to both burners. Fig. 3 shows the motor bell fully raised to its highest position; the gas passage to the pilot-burner being closed by the small bell G which is immersed in its mercury seal while the bell F is raised clear—thus leaving the gas passage to the main burner open. Fig. 4 shows the motor bell again in its lowest position engaged or ready at its next rise to reverse the last preceding operation. This alternate opening and shutting of the gas outlets continues so long as the gas pressure is first reduced to the engaging pressure and then raised to such a pressure as will raise the motor bell to its highest position.

The method of operating the apparatus is as follows: The mercury seals are filled, and sufficient weight is placed on the motor bell to correspond with the predetermined pressure at which the device is to be operated. One of the burners is then lighted; and when it is desired to extinguish this burner and light the other the pressure in the main is reduced, which causes the motor bell to fall into the position shown in figs. 1 and 4, while the beam and small bells retain their positions. The pressure is then increased, with the result that the bell rises and reverses the position of the beam and small bells—thus extinguishing one burner and lighting the other.

Withdrawing Low-Grade Gases during the Charging and Discharging of Retorts and the Like.

KOPPERS, H., of Essen-Ruhr, Germany.
No. 21,269; Sept. 25, 1906. Date claimed under International Convention, Oct. 23, 1905.

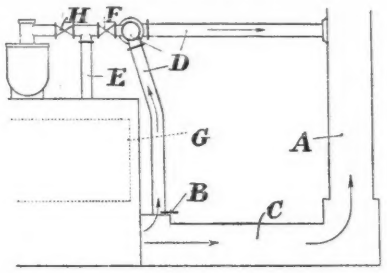
The suggested utilization of the gases and vapours evolved during the discharging and charging of coke-ovens when the main gas conduit is disconnected in a furnace or condensation plant would appear, the patentee remarks, to be of little value industrially in most cases, owing to their low value. If it is desired to avoid inconveniencing the workmen by the free escape of such gases from the ascension pipes, by conducting them through a separate, temporarily connected conduit into the chimney, the risk of explosion has to be reckoned with, as this arises in view of the fact that the gas does not flow continuously, but is liable to collect and become dammed up in the conduits.

In accordance with the principle of this invention, gases of this kind, which are produced in dry distillation or gasification during the discharging and charging of the chambers or retorts, are conducted (as being of too little value for further utilization) through a separate conduit into a chimney; but the danger of explosion is obviated owing to the fact that the conduit is constantly traversed by a current of neutral gases.

As such neutral or inert gases, the combustion gases of the furnace will, he continues, of course suggest themselves in the first instance. By deflecting a portion of the combustion gases shortly before their admission to the chimney and transferring them into the conduit for the low-grade gases, which likewise leads into the chimney, a parallelly arranged, subsidiary path is provided for the combustion gases. By inserting and removing a suitable resistance in this conduit—that is to say, by an appropriate adjustment of dampers—the quantity of combustion gases flowing through may be regulated.

The continuous current through the conduit, the prevention of the access of air by constantly filling all available space in the conduit with neutral gases and the larger dilution of the gases, which were already low-grade, render explosion almost impossible.

The following is an example of means for carrying the process into practice: A conduit connected, on the one hand, with the chimney and, on the other hand, fitted to the combustion gas conduit with the interposition of a damper, is carried along the ascension pipes of the retorts with which it is connected by branches. Every time an ascension pipe (and thereby a retort) is disconnected from the main gas-collecting conduit, the corresponding branch is connected with the low-grade gas conduit, so that the gases and vapours then present in the disconnected retort are conducted into the chimney.



Koppers' Arrangement of Coke Oven or Retort.

The method illustrated of carrying the process into practice consists of a conduit D connected, on the one hand, with the chimney A and, on the other hand, fitted to the combustion gas conduit C with the interposition of a damper B, is carried along the ascension pipes E with which it is connected by branches F. Every time an ascension pipe is disconnected, the corresponding branch F is connected with the conduit D, so that the gases and vapours then present in the distillation chambers G are conducted into the chimney. It is advantageous to connect the valve H of the ascension pipe and that for the branches F so that on opening the former the latter is closed and *vice versâ*. The reversal during the stages of the operation which have been referred to then takes place "without inconvenience or danger to the workmen."

Gas-Meters.

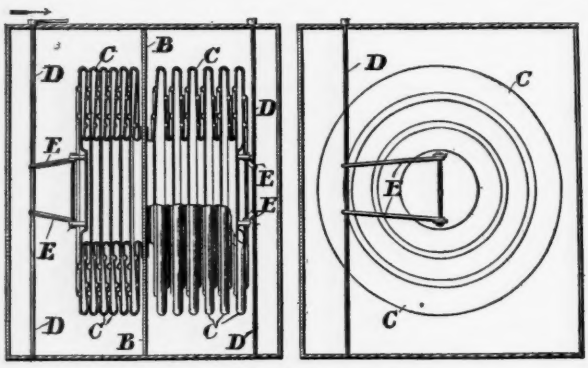
WEIR, A. S. J., and HENNING, T. J., of San Diego, California.
No. 22,405; Oct. 10, 1906.

This invention relates to "diaphragm gas-meters, in which the casing or body of the meter is divided by a central vertical partition into equal compartments or chambers, each containing a bellows or expansible diaphragm adapted to alternately receive and discharge a certain volume of gas and connected with valves controlling the alternate inlet and outlet of gas and also connected with a register."

The casing of the meter is rectangular, as usual with diaphragm meters. B is the vertical partition dividing the casing into two equal compartments. In each compartment is arranged an expansible bellows C provided with means by which the valves governing the inlet and outlet of gas from the respective compartments are operated, and also a registering apparatus (neither shown). Such means comprises a flag wire or rod D journaled in the meter-casing and provided at its upper end with a lever or crank arm connected with the valve and registering mechanism. The rod is connected with the bellows by arms or levers E, fast on the rod and pivoted upon a cross rod F arranged in lugs forming an attachment of the head of the bellows.

As shown, each bellows, secured to the partition B, is made of sheet steel and the details of construction are as follows: The head of the bellows is formed entire or integral, and its circular edge is turned inward as shown. All the remaining portion of each bellows is formed

of a series of annular sections, the outer and inner edges of which are turned inward but in opposite directions, so that they are adapted to overlap and fit upon the edges of adjacent sections. Such lapping portions are made gas-tight; and thus when the head and the required number of sections are secured together, a metallic bellows or diaphragm is formed, which has the "required degree of flexibility which allows it to expand under pressure of gas, and contract when relieved of such pressure."



Weir and Henning's Dry Gas-Meters.

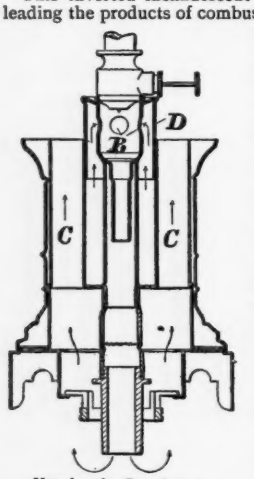
It is requisite, the patentees remark, that the bellows thus formed of flexible sheet metal shall have a certain degree of resiliency and at the same time the body of the several sections must have a certain degree of rigidity. This is obtained in part by circular corrugations (preferably two in each section) formed by striking up the sections in such manner that semi-circular grooves are formed on the inner sides and corresponding projections on the outer sides. Thus two circular concentric ribs or corrugations are formed on the outer side of each section. Further, the ribs or corrugations are so arranged that they are "staggered"—that is to say, the ribs of adjacent sections are not arranged directly opposite each other, but at different distances from the edges of the sections. Thus when the bellows collapses, as shown in the left-hand portion, the adjacent corrugations will not strike upon each other,but upon the body or plain surface of the opposite section. The convolutions of the bellows are in this way adapted to fit closer together when relieved of the pressure of gas than would be otherwise practicable.

Gas-Lamp.

HARRISON, C. W., of Middlesex Street, E.C.

No. 6819; March 21, 1907.

This inverted incandescent gas-lamp has conduits or uptakes for leading the products of combustion to the exterior of the lamp, terminating at a point below or adjacent to the air inlet apertures of the bunsen tube, and a hood or shield so arranged that the air induced into the bunsen tube is drawn from below the level of the outlet for the products of combustion, and thus prevents the latter from mixing with the induced air.



Harrison's Gas-Lamp.

As shown, the products of combustion of the bunsen tube ascend through uptakes C, which terminate below the inlet apertures B and "do not therefore present an unsightly appearance." D is the hood or shield mounted so as to prevent the products of combustion ascending the uptakes C from being drawn into the inlet apertures. The external air induced through these apertures passes through perforations in the body portion of the lamp to the spaces between the uptakes C and thence through the open end of D, which may be made capable of movement on the bunsen tube to enable the air inlet apertures to be adjusted when desired. The lower ends of the uptakes may be provided with a depending flange adapted to support the mantle holder in place on the lamp.

APPLICATIONS FOR LETTERS PATENT.

19,695.—WOOLLEY, A., "Gas-fired potters' kilns." Sept. 3.

19,706.—WAKEFIELD, C. C., "Acetylene generators." Sept. 3.

19,768.—EVANS-JACKSON, J. E., "Photometer." A communication from Haakon Bryhni, &c. Sept. 4.

19,795.—CLOUDESLEY, J. L., JUN, "Automatic gas lighting and extinguishing apparatus." Sept. 4.

19,799.—DAVIS, A., "Generators for acetylene." Sept. 4.

19,804.—BEST, W. N., J. H., and E., "Gas-stoves." Sept. 4.

19,811.—HARRISON, C. W. and NOAD, A. C., "Incandescent gas-lamps." Sept. 4.

19,873.—RIDER, C. H., "Extracting and manufacturing fuel gas from a mixture of mineral carbonates and organic substances," Sept. 5.

19,933.—DAVEY, W. G. S., "Mantles," Sept. 6.

19,963.—ANDERSON, D., "Inverted lamps," Sept. 6.

19,988.—GROSSMAN, J., "Treatment of ammonia liquors before and after distillation." Sept. 7.

20,009.—DELSAUX, S., "Valve-gear for gas lighting." Sept. 7.

LEGAL INTELLIGENCE.

VALUATION APPEALS IN SCOTLAND.

There has been quite a crop of appeals against valuations of gas-works in the South of Scotland, the hearings of which have been taken before the Valuation Courts. These have arisen through the action of Mr. Sulley, who is largely employed by local authorities in the South of Scotland as Assessor, in raising the valuations.

In the Selkirk Burgh Court last Tuesday, there was no appeal; but the Assessor reported that, following the decision in the Kirkcaldy Gas Company's case in the Court of Session, he had assessed the gas undertaking within the burgh on the basis of profits, as therein laid down. Last year the gas-works, which had always included the pipes, were valued at £385. When he first made his valuation this year, he assessed the whole undertaking at £1018; but for the convenience of the rating authorities, who assessed the pipes underground on a different basis from the rest of the undertaking, he entered them separately—assessing the pipes at £150 and the works at £868. These figures were calculated at a time when the Secretary of the Company was from home. A day or two after the Secretary returned, he saw him; and having ascertained that the profit from the undertaking situated in the county amounted roundly to £120, he adjusted £900 as the total valuation. On going into the profits earned by the Company during the last twenty years, he found that for rating purposes, and on the basis of the Kirkcaldy case, they averaged as nearly as might be, £385 per annum, which was his former valuation.

The Selkirkshire (County) Valuation Court was held the next day, and in it an appeal was taken by the Gas Company against the valuation of the pipes outside the burgh. It was said, on behalf of the Company, that the Assessor had raised the valuation from £15 to £400; that in the burgh the valuation had been fixed at £993; and that the Company were prepared to accept £90, being one-eleventh of the whole valuation. Last year the make of gas was 34 million cubic feet, and of this, over 3 million cubic feet was taken by consumers in the county. It might seem strange that the pipes had been entered at £15; but they had been entered on a wrong principle. Mr. Sulley had drawn attention to the principle; and they had accepted his figures. Mr. Sulley said he found that there had been a great under-valuation, and that the county had suffered consequently in loss of rates. He submitted that when he brought before them the fact that they had been deprived for many years of a large amount in loss of rates, the sum of £400 was quite equitable. The circumstances were exceptional. In the first place, the Gas Company admitted the fact of under-valuation, and were now making an offer to the county. The sum of £15 was fixed by Mr. Sulley's predecessor. Evidence was led; and the Court having deliberated in private, the Chairman—Mr. C. H. Scott-Plummer—stated that, in their opinion, they were not justified in fixing a larger sum on the enterprise because in previous years they had had a small valuation. They must fix a valuation which might be considered as near as possible to be the valuation from year to year. They therefore decided to fix the valuation of the county section at £95, which was something like one-eleventh of the total value.

In the Roxburgh County Valuation Court last Tuesday, the Melrose Gas Company appealed against the valuation of their works being raised to £456, and asked that it be reduced to £248. Mr. Sulley said that on the usual basis the valuation should be £248; but he found that there had been an exceptional decrease in the profits. He therefore proposed to adopt the basis of an average, as was done in Fife and some other counties. The figures for the past five years brought out £456. The practice was one which was adopted throughout a large part of Scotland. On behalf of the Company, it was maintained that in no case had Mr. Sulley's contention been upheld by the Courts. The result of a definite calculation on the year as it stood had always been upheld by the Courts, and should be adopted in this instance. A member of the Court said that this method of taking an average seemed to have been sprung on the Melrose Gas Company, whose works had previously been always valued year by year. The Court dismissed the Company's appeal; but, on the request of their Solicitor, they agreed to state a case for the Court of Session.

A decision by the Valuation Court for the City of Dundee seems to fix an awkward principle for the valuation of suction gas-engines. Messrs. E. & G. Gibb, manufacturers, appealed against the value of their engine being entered at £100. The engine, the appellants stated, cost £1200. It was rated at 45 H.P. nominal, but was capable of working up to 200 H.P. At the present time, it was only working at 60 H.P. There were only 900 spindles in the place; but the engine could drive 3000. It was claimed that the engine should be taxed on what work it was performing. The rent of the property was £140, and with the engine at £100 it would be £240. Only a small amount of machinery had been put in. If the engine were fully employed, there would be no complaint against the valuation. They considered that £240 a year on 900 spindles was too high, and suggested that the valuation of the engine just now should be £30. With Welsh coal the engine might work up to 200 H.P., but with Scotch coal it could not go beyond 150 H.P. Mr. G. C. Brown, the Assessor, said the cost of the engine and shed it was situated in was £1250. The rule was to charge 7½ per cent. on outlay of this kind for valuation purposes; but he was not satisfied that, in dealing with machinery, this was sufficient. Machinery depreciated much more quickly than buildings; and if a proprietor were to let a machine, he would require more than 7½ per cent. of the cost for rent. Depreciation could hardly be taken at less than 5 per cent., and that would leave him with only 2½ per cent. as interest on the capital in the plant. It had been argued that with 60 H.P. the rate was equal to £1 13s. per horse power; but in a case from Arbroath in the Court of Session it had been brought out that in ten cases the rate per horse power varied from 15s. to 40s., according to the nature of the engine. According to Act of Parliament, an engine was a heritable subject; and the rule was to assess it as a whole, whether it were fully occupied or not. Mr. Councillor Speed asked if

Mr. Brown knew a case where an engine was treated in this way. Mr. Brown replied that he did not; but it would be impossible for an assessor to know up to what extent every engine in the city was working. One of the appellants said he was convinced that the valuation was excessive and unjust, and that he could not work under such conditions. Mr. Brown replied that his valuation was only at the rate of 10s. per horse power, whereas in Arbroath from 15s. to 40s. had been allowed on steam-engines. The Court fixed the valuation at £90; and an appeal was intimated by Messrs. Gibb.

Bankruptcy of a Lighting Specialist.

The public examination of Reginald Arthur Williams, trading as the Universal Lighting Company, of Victoria Street, S.W., was held at the London Bankruptcy Court on Tuesday last before Registrar Giffard. The statement of affairs filed by the debtor disclosed gross liabilities amounting to £751 7s. 10d., of which £741 7s. 10d. was expected to rank against the estate for dividend. The assets were estimated to produce £112 4s., thus leaving a deficiency of £629 3s. 10d. Replying to questions put by the Official Receiver, debtor stated that prior to 1903 he was engaged in various occupations in this country and South Africa. He then with a capital of about £50 commenced business as an oil merchant at Cardiff Exchange. The business was unsuccessful, however, and he closed it. He then obtained employment as canvasser for a Cable Company, earning £5 per week. In December, 1906, he was joined in partnership by another (who put £500 into the business), and they traded as Buss and Williams, lighting contractors, at No. 25, Victoria Street, S W. The partnership was dissolved about five months afterwards, and debtor agreed to take over the assets £235, and liabilities £83, and repay the £500 advanced by his partner, less £90 which the latter had drawn out of the business. He (Williams) then continued the business under the style of the Universal Lighting Company; but he was always handicapped by want of capital, and a committal order having been made against him these proceedings ensued. Debtor alleged his failure to have been caused through want of capital. He had no household furniture, and resided in furnished apartments. The principal part of his business consisting of tendering for lighting contracts at large houses. He knew nothing about the business before he joined Mr. Buss; but he was well acquainted with the gas-mantle trade. He admitted that he changed a cheque for 30s. with a chemist to whom he owed 1s. 3d. The chemist handed him the balance 28s. 9d.; but the cheque was not met. He justified this action by the fact that he was expecting a cheque which he would have paid into his banking account to meet the 30s. cheque. The examination was closed.

Water for Cooling Beer.

At the Ashton Borough Police Court recently, Alfred Buckley, Licensee of the Clarence Inn, Old Cross Street, was summoned at the instance of the Joint Water-Works Committee with misusing water on July 25. The Town Clerk (Mr. F. W. Bromley), who prosecuted, said that on the night of July 24 it was found there was an excessive use of water on the defendant's premises. In consequence, Mr. J. A. Wild, the Manager of the Water-Works Department, went to the defendant's house the following day, and saw his wife, and told her he and the waterman had come down to test the fittings. In the cellar they found that an india-rubber hose had been attached to a tap, and water was running on the floor of the cellar under the beer barrels into a drain on the other side. Mr. Wild asked for an explanation, and defendant's wife said it was to keep the beer cool. It was difficult to discover cases of this kind, inasmuch as they could not be continually going into public-houses to see what was being done to cool the beer. The tap was probably turned on night and day; and very serious waste of water must have taken place. The defendant said he had been swilling the cellar the night before, and forgot to turn the water off. The water was not running to cool the beer. He denied the statement said to have been made by his wife. Mr. Wild deposed that the water was running at the rate of about 100 gallons per hour. The defendant said that every time there was heavy rain, the cellar floor got covered with sludge, through water coming up the drain. He acknowledged that the tap was running all night, but urged that it was a mistake. The Chairman said the defendant would be fined 40s. and costs; and the advocate's fee would be allowed. He added that the defendant had been robbing the Joint Water-Works Board.

Reign of Darkness at Corbridge.—In consequence, it is reported, of the Corbridge Gas Company and the Parish Council being unable to agree as to the terms for lighting the village and approaches during the ensuing winter, the lamps have not yet been lit; and as the former show no signs of relenting, the Sub-Committee of the Parish Council were, at their last meeting, empowered to make such other arrangements as might be deemed necessary in regard to the matter. In the meantime, the streets will remain in darkness at night time.

The Reinstatement of Streets after Main-Laying Operations.—The Works Committee of the Deptford Borough Council on Monday last week reported having considered a letter from the Clerk to the Metropolitan Water Board, stating that that authority had entered into agreements with various local governing bodies under which those bodies undertook the duty of reinstating at an agreed schedule of prices, the surface of roads and footways broken up for the purposes of the Metropolitan Water Board's work, and inquiring whether the Deptford Council desired to enter into such an arrangement. The Committee had inquired into the matter, and had found that it was not the practice for the Deptford Council to enter into any agreement with companies having statutory powers to break open roads, to reinstate same after being opened up; and the Committee had come to the conclusion that it was preferable that the duty and responsibility connected with the reinstatements should remain with the companies—the work, of course, having to be executed to the satisfaction of the Council's officers.

MISCELLANEOUS NEWS.

GASLIGHT AND COKE COMPANY AND METER-RENTS.

In accordance with the decision arrived at to re-impose meter-rents, instead of raising the price of gas to meet the increased cost of coal, the Gaslight and Coke Company last week sent out notices intimating that, as from Michaelmas next, quarterly rents will be charged on the Company's ordinary meters. The rent of a 5-light meter will be 9d. per quarter; and the charge will, of course, be varied according to size. The circular is in the following terms:—

The Directors have to announce that the Company's contracts for the supply of coal and oil for the next twelve months have been made at prices seriously higher than those of last year, involving an increased expenditure of some £250,000; and that, though the Company will in all probability receive better prices for coke, the increased revenue from this source will not be sufficient to meet the increased price of raw materials. As an alternative to raising the price of gas by 1d. per 1000 cubic feet, the Directors have decided, with the concurrence of the London County Council, to re-introduce meter-rents, which are estimated to yield a revenue amounting to about ¾d. per 1000 cubic feet of gas sold. Meter-rents are charged by the other Metropolitan Gas Companies, the Suburban Gas Companies, and also by electric lighting companies. The Directors of the Company feel that the charge is a perfectly fair one; and, moreover, they are anxious to put an end to the absurdity of having to provide large and expensive meters, free of cost, for a certain section of the public who only consume gas as a stand-by at times when other systems of lighting fail them.

It should be added that, though the London County Council were agreeable to meter-rents being charged as from Midsummer last, the Company have decided that the charge will not commence until Michaelmas next. The Directors are most anxious to reduce the price of gas at the earliest possible moment; and it is to be hoped that the price of coal will not be long maintained at its present high figure. As soon as the price of coal allows, the Company will give their consumers the benefit of the reduction in the price of gas.

BRADFORD'S MUNICIPAL UNDERTAKINGS.

The Question of Profits.

At a Meeting of the Bradford City Council last Tuesday, Alderman David Wade made his annual statement with regard to the trading departments of the Corporation.

He said that the outstanding feature of last year's report upon the trading concerns, having regard to the large capital invested, was probably the small aggregate net profit—namely, £365. Last year he ventured figuratively to describe that result as "sailing very near the wind;" and he had had no reason to alter his opinion. With an invested capital of £6,500,000, £365 net profit left no margin for possible contingencies, which were the common heritage of them all. They were inherent in the natural order of things; and Bradford as a Municipality could not expect, more than other towns, exceptional freedom therefrom. Unforeseen disasters in gas-works, electricity works, water-works, and tramways—in which last-named department there had recently been experienced an unfortunate illustration—all pointed to the great importance of taking into serious consideration the question of improving the small margin which these several undertakings provided to meet such contingencies. The necessity of forming a small Executive Committee to deal, among other subjects, with questions of this character was a step which he thought the Council should take. The Council would be glad to know that, as a whole, they could show an improvement upon the £365 of the previous year. The aggregated surpluses and deficits showed a net surplus of £10,610. It should be mentioned, however, that this result had been achieved mainly through the water-works equation scheme, which provided for a consolidated and accumulating sinking fund for redemption of its debt, and which, having regard to the terms under which the scheme was drawn, had relieved the expenditure to the extent of £10,525. It would be seen, therefore, that, apart from the relief afforded by the scheme, the net aggregated surplus for the past year would have been £85, as compared with the £365 during the previous year. The surpluses and deficits for the year were as follows: Surpluses: Water-works, £3016; gas, £3486; electricity, £4451; markets, £1877; workshops, £70—total, £12,900. Deficits: Conditioning house, £276; team labour, £1819; slab-making, £81; milk depôt, £114—total, £2290. Apart from the relief afforded by the equation, the water-works would have shown a deficit of £7509, instead of a surplus of £3016. The balance of income over expenditure in the tramways account (£14,536) had been transferred to the renewals fund, as in previous years. Turning to the figures of the several trading concerns separately, and commencing with the water-works, Alderman Wade said the gross income of this department was £179,547, and the working expenses £35,630, leaving a gross profit of £143,917. Interest and sinking fund absorbed £140,901, leaving a net profit of £3016, as compared with a net loss the year previous of £9117. The deficit of the water-works at the beginning of the year was £28,496; and the net profit of £3016 reduced the deficit to £25,480. This deficit would doubtless be further substantially reduced during the present financial year through the operation of the equation scheme. The total income from the gas-works, including residual products and rental of meters, was £286,800. The working expenses for the year were £221,344, leaving a gross profit of £65,456. Against this there was charged for interest and sinking fund £61,970, leaving a net profit of £3486, as compared with a net profit of £6022 the previous year. The unappropriated profit at the beginning of the year was £5438. Of this sum, £5000 was ear-marked to the relief of the rates, leaving £438; and this, with a net

profit of £3486, made an unappropriated profit at the end of the year of £3924, or less than at the beginning of the year by £1514.

Having dealt similarly with all the other departments, he said he would ask the Council whether, in the event of an unexpected turn in the wheel of circumstances, it would not be found that, as advocates of the principle of cost price, their ambition had not over-reached itself, and led them to miss the meaning of cost price in its strictest commercial sense. To make ends meet as compared with the realizing of large profits from dear commodities, in order to secure a less poundage rate, of course, raised a plain and straightforward issue. It was simply a revival of the old question of direct *versus* indirect taxation, into the merits of which he did not wish to enter at any length. But he could not refrain from repeating what he had aforetime stated—that commodities sold to themselves at cost price (which price must include all charges incidental to the undertaking) were just as essentially profits from a practical point of view as if twice the charge was imposed, and the surplus applied to the relief of the poundage rate, because in the case of the lower charge the difference was profit retained in the ratepayers' pocket, instead of being taken out and appropriated under the name of profit towards the reduction of charges under another heading of account. Cost price in a co-operative body was profit in disguise—profit in another dress. If the Council chose, for the sake of appearance, to raise the price of gas, for instance, to the average price of the majority of the principal towns, they would secure, with the same consumption, between £40,000 and £50,000 so called profit, which would have the effect of reducing the rates by (say) 8d. in the pound; but it would be taking it out of one pocket and putting it into another. He put this before the Council as a proposition—that on general lines ratepayers, who were legally the owners of all the public services within their area, could never make a profit out of themselves. It was only a question of what head of account they should pay under. If they paid more than was required for commodities, the surplus went back to them in relief of rates under the head of non-trading departments. As a conglomerate body, ratepayers were neither better nor worse in pocket under either system, except that with huge trading profits they must sacrifice, for the sake of appearing to have made such profits, the income-tax of 1s. in the pound to the Inland Revenue—just for the passing glory of a paper surplus. They must pay 1s. in the pound on such surpluses to the national exchequer; while every such shilling rightly belonged to the ratepayers within the limits of the Bradford area. The relative size of the poundage rate as between municipal authorities was too readily accepted as the test of good government and administration. If the rate was low, the government was good; and *vice versâ*. The man in the street and the stranger who came to Bradford to make his abode asked as a primary question—the answer to which he regarded as a conclusive proof of the efficiency or otherwise of local government—What are the rates in the pound? Upon the poundage rate alone he often determined and assessed in his own mind the stability of the town and the comfort and security of citizenship. Such a test might be popular; but taken by itself it was as poor as it was popular. If ratepayers wished to institute a comparison of the burdens of local taxation as between one town and another, they must put all charges into the melting-pot. If the State were to nationalize all the public services and create a common fund into which all temporary surpluses were paid, and to which all temporary deficits were charged, and if such a fund were made to hold the balance against fluctuating Army and Navy votes, &c., they would have arrived at, or at least be travelling in the direction of, an ideal state of taxation. And what was good when applied to the nation, was good when applied to local administration. A steady poundage rate, if it could be secured, was better, and revealed a sounder administration, than a fluctuating one brought about by the caprice of Party or from any other cause. Upon the recent estimates of the various Committees, combined with the watchful expenditure of the last year, the Council were able to reduce the rates by 2d. in the pound for the current year. He should have been glad to recommend a further reduction; but the logic of facts was against it. There was a certain amount of leeway to make up before they began relieving rates; and they must be just before they were generous. Though there was a small surplus in the gas and electricity departments, there was a considerably larger deficit to overtake in the water-works department, and towards which the Council refused to levy a rate; and to relieve rates by small surpluses and leave larger deficits to take care of themselves, was bad finance. A company whose dividends were one year upon the mountain top and in the next down in the valley, would not invite public confidence or be likely to attract shareholders. The trading concerns of the Corporation were of no mean or trifling dimensions. In proportion to population and rateable value, they ranked prominently among the municipalities of Great Britain. Talk about combines—they were the largest combine in Bradford. They had expended over £11,000,000; and they employed over 8000 people. The proper guidance of this gigantic undertaking called for the exercise of their keenest powers and their best judgment. If the private trader could succeed, then so could the Corporation, who ran precisely similar concerns. He would never believe that they could not bring the same amount of intelligence to bear in the committee-rooms of the Corporation as was to be found in the board-rooms of private companies. But they must remember that among a body of directors Party played no part when dividends were the aim; and if they buried the factitious spirit in one common endeavour to secure the interest of all, they would achieve that solid success which always waited upon singleness of aim and unity of purpose, and for which—rightly understood—their charters of incorporation had doubtless been granted.

At the conclusion of the speech, there was some criticism of Alderman Wade's views. Several members professed to perceive a strong vein of humour in what had been said; while others twitted the Alderman with inconsistency. One member argued that the speech was in direct opposition to principles advocated last year. He instanced the taking of £5000 from the gas profits in relief of the rates; while now the principle of allocating profits in this way was apparently regarded by Alderman Wade as unsound. Eventually, however, the minutes of the Finance and General Purposes Committee were adopted.

RIVAL GAS SUPPLIES AT DRAYCOTT.

Intended Application to Parliament.

Mr. E. Jardine, J.P., the Chairman of the Draycott Gas Company, in an interview a few days ago with a representative of the "Nottingham Daily Express," stated that his Company intended to apply for an Act of Parliament prohibiting the Long Eaton Gas Company from entering the Draycott district. "We intend," he said, "to fight them. I believe the people of the district are really in sympathy with us, and that there is a growing feeling of antagonism in Long Eaton itself against the action of the Company in supplying the stranger out Draycott way with gas at 2s. per 1000 cubic feet, while the old consumers in Long Eaton have to pay 3s. I should not be surprised at their resentment going so far as 'passive resistance.'" After adding that the Draycott Company did not object to fair open competition, Mr. Jardine said: "What we do object to is our opponents exploiting the Long Eaton consumer for the purpose of crushing a successful little Company. We are prepared to fight them on equal terms; and if they would supply Long Eaton at the same price as they are supplying Draycott, we should not mind."

The Draycott Company, Mr. Jardine explained, have no powers at present excluding other companies from coming into their district, but the Long Eaton Company have powers which prevent any other company competing with them in the Long Eaton district. The next move, therefore, is for the Draycott Company to apply for an Act of Parliament; and he expressed great confidence in their ultimate success in this direction.

OTTOMAN GAS COMPANY, LIMITED.

Steady Progress Reported.

The Ordinary General Meeting of the Company was held on Tuesday last, at the London Offices, No. 9, Queen Street Place, E.C.—Colonel JAMES LE GEYT DANIELL in the chair.

The SECRETARY (Mr. Thomas Guyatt) read the notice convening the meeting, the certificate of the Auditors, and the minutes of the previous meeting; and the report and accounts were taken as read. The report stated that the gas-rental for the half year to June 30 amounted to £14,802, compared with £13,261 for the corresponding period of 1906; while the net profit was £3187, against £2991. The amount standing at the credit of profit and loss account was £9422.

The CHAIRMAN, in moving the adoption of the report and accounts, remarked that it was with some difficulty that he could find language in which to address the shareholders, without fear of repetition, year after year. Considering first the debit side of the balance-sheet, it would be seen that there was an item "Sundry creditors, £2384," against £1946 in the same period of the previous year. The amortizement account, of course, increased year after year. Turning to the credit side, there was "Sundry debtors, £12,973." There was very little explanation to give in regard to this. The amount was something like £1900 more than in 1906; but all these things varied from time to time. Investments had not increased on the present occasion; but with reference to this matter, he might mention that in the present half year £2000 had been invested, and would appear in the current half-year's accounts. Coming to the revenue account, he had to report with regard to business a steady improvement all round. With the greater quantity of coal carbonized—it was not very much more, only some 150 tons—an increase in the cost might have been looked for; but actually the expenditure under this head was £496 less. That was owing to a fortunate arrangement made on this side, and also to the supply of local coal, which was referred to at the last meeting. Therefore they were in a very comfortable position. Depreciation renewals and repairs showed an increase of some £1500, it was accounted for by the additional outlay for which the shareholders had already been prepared. Salaries were higher, owing to the arrangement they were most fortunate in making by which Mr. A. F. Phillips had been appointed Consulting Engineer. On this appointment the Company were to be congratulated; and he was sure any expense on this head would bear fruit abundantly. Mr. Phillips was in communication constantly, not only at Smyrna, but at home, with Mr. Gandon, since he had been here. There was a perfect understanding between them; and he did not think there had ever been the slightest difference of opinion on the various points that had to be discussed. The Company must not only keep pace with developments, but must prepare for them; and they owed much to the activity and unstinted service of their staff, who had spared no pains in looking after everything. There had been a thorough examination of the mains throughout; and the staff had met with cheerfulness every demand made upon them. It gave him the greatest pleasure to mention this fact in the presence of their friend Mr. Gandon. It would be a satisfaction to the shareholders to know that everything—whether in the works or in connection with the distribution—was in first-rate order; and that the Company generally, as well as the works, could not, in the opinion of the Board, be in a sounder position. So much for the past and present. With regard to the future, no one knew what it might bring forth; but he for one, in consequence of the arrangements that had been made, had no fear at all. They had through Mr. Gandon to constantly negotiate with the authorities in Smyrna; and all he (the Chairman) could do was to express the hope that moderation and wisdom might attend their counsels, and that in altering existing, or making fresh, arrangements with the Company, such terms would be suggested as it would be possible for the Company to accede to.

Mr. STEPHENSON R. CLARKE seconded the motion, which was at once agreed to.

On the proposition of the CHAIRMAN, seconded by Mr. H. WARD ANDREWS, a dividend was declared for the half year ended June 30 at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 7 per cent. per annum on the ordinary shares, tax free.

The CHAIRMAN remarked that he had made passing reference to the services of the Engineer, Secretary, and staff generally; and he would now like to propose a very hearty vote of thanks to them.

Mr. A. M. PADDON, in seconding, said that, of course, the Executive of the Company were led by three personalities—Mr. Phillips, Mr. Gandon, and Mr. Guyatt. With regard to Mr. Phillips, it might justly be remarked that his was a name to conjure with in gas matters. His business had taken him not only to all parts of this country, but to all parts of Europe, and even farther afield; and with reference to any undertaking with which he had been connected, he (Mr. Paddon) had known nothing but success. To the Ottoman Company he was of the greatest value, on account of his particular knowledge of the gas industry of the South of Europe, and everything appertaining thereto. As to Mr. Gandon, they were all very glad to see him here to-day, because the votes of thanks that had been passed to him at previous meetings had always been couched in such terms that he was sure he would be pleased to be present to hear them. With the co-operation of Mr. Phillips with Mr. Gandon, he thought they might say that their engineering branch was co-ordinated in the best possible manner. As to Mr. Guyatt, he did not know what they would do without him. The Directors received from him that support which could only be derived from his long connection with the Company and his zealous services.

Mr. GANDON, in returning thanks, said he was pleased to say that the general prosperity of Smyrna went on increasing steadily. Cultivation in the interior was increasing very rapidly, and under very much better circumstances than hitherto. People were beginning to put more money into their land, and to understand that cultivation could not be carried on in the haphazard way that it had been in the past. At the same time, local industries were beginning to take root; and, of course, all this affected their Company in a very favourable manner. What would happen in the future, he could not say; but the prospects were most excellent. They had been obliged of late years to meet considerable increases in demand on the part of their consumers; and he was sure the shareholders must feel very well satisfied that this had been done without adding to the capital account to any appreciable extent. The Smyrna staff were most loyal in advancing the Company's interests, and did everything possible to aid the prosperity of the undertaking.

Mr. GUYATT also acknowledged the vote.

Mr. W. A. HOUNSOM proposed a vote of thanks to the Chairman and Directors; remarking that there were two points which he thought were more eloquent than any words he could say. The first was the extremely small attendance of shareholders at the meetings; and the second the small amount of the transfer fees—7s. 6d.

Mr. A. W. OKE, in seconding, said it was a satisfaction to feel that the prospects of the Company were so good. He was glad to hear the Board were seeking to obtain a portion of their coal from local sources; and he hoped that one of the results of the present rise in price would be to bring further new supplies into the market. Also that it would make people more economical, and induce them to employ to a larger extent the most excellent gas-stoves which were now, if carefully used, a source of considerable saving.

The CHAIRMAN acknowledged the vote.

ILFORD GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the Offices, Broadway, Ilford, on Monday last week.

The CHAIRMAN (Mr. W. Ashmole) in moving the adoption of the report and accounts, congratulated the shareholders heartily upon the excellent half-year's working, and expressed the hope that the soundness and vitality shown by the undertaking would be long continued. He thought it needed considerable courage on the part of the Board at the beginning of the year, in face of a rising and already inflated coal market, to make so substantial a concession to consumers as a reduction in price of 3d. per 1000 cubic feet; and it was particularly gratifying that the accounts now presented not only justified, but conclusively proved the wisdom of the policy adopted. The reduction resulted in an immediate increase in the number of consumers and the sales of gas. The increase of consumers and the reduction in price, therefore, acted and re-acted upon each other; and it was obvious that not only was it to the Company's interest to encourage the use of gas but to the direct advantage of present customers to obtain additional consumers. The revenue account showed a satisfactory state of affairs. Under the heading of manufacture, a saving of more than £500 over the previous half year was made, notwithstanding an increased sale of nearly 10 million cubic feet. Raw material cost £129 more; but £490 was saved in working expenses, and repairs cost £228 less. Distribution cost rather more; but the remaining items were about normal. Taken altogether, the expenditure was £156 less than in the corresponding half year; and, in view of the increased production, this result was most gratifying. On the credit side of the account, the revenue from gas fell off by £458, as compared with the previous half year; but remembering the reduction of 3d. in the price charged, this, too, might be considered extremely satisfactory. Rental of meters and stoves showed an advance which, together with the improved prices obtained for residuals, accounted for an increase of £1145. The balance of £9157 carried to the profit and loss account was more than £500 in excess of the preceding half year. With regard to coal, the Company were at present very favourably situated; and the Directors hoped that, before it became necessary to renew their contracts, the market would have begun to return to its normal level. The Chairman, in conclusion, said: The prosperity and wellbeing of our country and of its manufactures has been in the past dependent greatly upon our coalfields; and this continues to be the case at the present day. We possess an article for which there is a great demand in other countries, and which they cannot produce themselves. Can we wonder now that the small duty which was previously charged has been knocked off, that our harbours are crowded with foreign shipping anxious to take away from us that which we only can produce? Not only does the foreigner pay no duty, but his demands necessarily keep up the prices which would otherwise tend to drop. We can obtain from no other nations similar advantages for ourselves.

The report and accounts were adopted, and a dividend for the half year at the rate of 6 per cent. per annum on the "A" and "C" stocks and of 4½ per cent. per annum on the "B" stock (less income-tax) was declared, with £1100 carried to the reserve fund.

Votes of thanks to the Directors, officers, and staff concluded the meeting.

Alluding to the changes effected during the half year in the engineering department, the Chairman, in the course of his speech, said: I cannot omit to refer to the serious loss the Company sustained by reason of Mr. Johnston's appointment as Engineer and Manager of the Brentford Gas Company. The Brentford Gas Company supply gas over a very considerable area, which has a population of 330,000, compared with ours of 60,000 or 70,000. They have an annual make of 2218 millions, and the consumers number 56,000, as against our 10,800. To be appointed to such a position shows the confidence the Brentford Company have in Mr. Johnston's ability, and is certainly also a reflex compliment to this Company. The zeal, energy, and ability of Mr. Johnston in the service of this Company have been acknowledged over and over again; and I can only say we heartily congratulate him, and trust he will have a prosperous and successful career in the future. Mr. W. B. Farquhar, our late Assistant Manager, who has been with us some years, has been appointed Mr. Johnston's successor; and having had experience of his capabilities, I believe we can fully rely upon him to carry out successfully the duties of such a responsible position.

DOVER GAS COMPANY.

Price Not to be Increased.

The report which the Directors of the Dover Gas Company submitted at the recent half-yearly meeting stated that the profit was sufficient to admit the payment of the full statutory dividend and leave a balance of £297 to be carried forward. It was, however, added that the gratifying results thus indicated were somewhat offset by the very heavy rise in the cost of coal. The Board had entered into contracts for the year's supply upon as favourable terms as it was possible to secure; but the extra cost was equivalent to an increased price of gas of 4d. per 1000 cubic feet, without considering any possible increased value of residuals. They were fortunate in having a sum of surplus profits, arising from past years' workings, which was available to meet any insufficiency of profits for dividends during the current half year; and therefore they did not propose to raise the price of gas at present. The mains in some districts were proving inadequate to meet the growing demands arising from the increased consumption in those districts; and a further small amount of capital might be required to provide the necessary outlay to supply the deficiency.

The Chairman (Mr. Willsher Mannering), in moving the adoption of the report and accounts, congratulated the proprietors upon the result of the past half-year's working. He pointed out that the accounts showed a profit (including £125 received from interest on investments) of £4610; and after providing for interest on loans and placing £250 as usual to the Trevanion Street holder suspense account, there remained a sum of £3859, which was sufficient for the full parliamentary dividend, and would leave a balance of £297 to be carried forward. The surplus was £329 less than in the corresponding half of 1906; and this decrease was owing to the higher cost of coal. It was satisfactory to note there had been a slight increase in the volume of business. The quantity of gas sold was 112,359,800 cubic feet, against 111,743,300 cubic feet—an increase of 616,500 cubic feet, equal to 0 6 per cent. This gave an increased rental of £106; and meter and stove rentals were also £23 more. Against this, residuals realized £132 less, due to the lower value of tar. The total revenue was £23,672, against £23,675. A comparison of the expenditure side showed an increase in coal of £458. A lesser quantity by 93 tons was used; and the cost was 9½d. per ton more. Purification was £98 less, wages £31 less, and repairs to works and plant £215 less, distribution and salaries £17 more, renewals of mains and services £256 more, repairs to meters £65 less, rates and taxes £25 more, public lamps £9 more, and management and sundries £22 less. The items on the whole, exclusive of coal, were less by £125. The total expenditure was £19,187, against £18,854, or an increase of £333. The number of consumers had gone up from 6297 to 6353; and the number of cookers and heaters on hire, from 4931 to 5946. There had been a small expenditure of £106 on capital account for new and additional mains and services. But for the serious rise in the price of coal, the affairs of the Company would have been in all respects eminently satisfactory. The Board had entered into fresh coal contracts for the year's supply at an average increase of 3s. 6d. per ton. This meant a total of £4000, and was equivalent to an increased price of gas of 4d. per 1000 cubic feet. Fortunately, there was a surplus profit balance of £4879 available for dividends; and the Directors also anticipated that the enhanced price of coke would help them to some extent. Then they might well suspend writing-down the automatic meter fittings account. This item was reduced to £14,170, for which there was full money value in 3652 complete automatic-meter supplies. Under these circumstances, they hoped to get through the twelve months without raising the price of gas. Beyond this, it was impossible to say anything. The Board contemplated laying a large and new main from the works to Frith Road. This would not only be ample for the neighbourhood, but act as a feeder to other mains, and ensure a more efficient supply generally.

The report was adopted, and a dividend for the half year at the rate of 7½ per cent., less income-tax, was declared. The Directors and officials were warmly thanked for their services; and this sign of confidence was acknowledged by the Chairman, the Resident Engineer (Mr. Raphael Herring), and Mr. E. C. Fielding, who expressed regret that his father, Mr. George Fielding (the Secretary), who had attended the meetings for 50 years, was not well enough to be there that day.

LARGEST GASHOLDER IN INDIA.

There has recently been erected in India, by Messrs. Clayton, Son, and Co., of Leeds, for the Oriental Gas Company, Limited, the largest holder in that part of the world; and it was formally put into use on the morning of the 21st ult. The holder is at the Company's works at Sealdah, which supply Calcutta with gas; and its capacity is a million cubic feet, which is sufficient for a day's requirements of the city.

The party who had been invited to be present at the christening and inauguration ceremony (which included the Municipal Commissioners) were welcomed by Mr. James C. Watson, the Manager, on behalf of the Gas Company. He explained that the work had been carried out by Messrs. Clayton without any serious accident; and it had given great satisfaction. There were two lifts, each about 150 feet in diameter and 30 feet deep. The tank and holder were constructed of mild steel, and weighed 742 tons. The tank contained about 14,500 tons of water; and having made several excavations to determine the condition of the ground for supporting such a weight, it was finally decided not to disturb too much of the subsoil, and to put in only 2 feet of cement concrete. The tank being equally loaded over its whole area was in its favour; and he was glad to say it was perfectly level, and there was no settlement whatever. The whole of the erecting was done with Indian labour, under European supervision; the quality of the work being excellent. The inauguration of the holder was, he hoped, also the inauguration of a new and promising future for the Gas Company; for they had now a supply of gas during the whole of the 24 hours, which meant a large accession of business for engines, cooking-stoves, and all sorts of appliances for heating, &c. Their thanks were due to the Hon. C. G. H. Allen (Municipal Chairman) for his kindness in coming to turn on the first gas from the new holder to the City of Calcutta. Knowing the keen interest Mr. Allen always took in everything that was conducive to the comfort and convenience of the citizens of Calcutta, he had great pleasure in asking him to undertake the duty of acting as sponsor to the new structure, and to perform the good old-fashioned ceremony of breaking a bottle of wine for luck. He would ask him to name the holder the "Robert Hesketh Jones," after the Chairman of the Oriental Gas Company, and then to turn on the gas to Calcutta.

Mr. Allen remarked that, before turning the valves, he would like to say how warmly they welcomed this enterprise on the part of the Company, which was one of the great private enterprises the success of which was famous in Calcutta. The big structure before them was an example of what could be done; and everyone wished success to the Company. He then turned on the gas.

EXPLOSIONS IN ELECTRICITY CULVERTS.

Causes other than Coal Gas Responsible.

The City Electrical Engineer of Aberdeen (Mr. J. Alex. Bell) has prepared a report for the Gas and Electric Lighting Committee of the Corporation on certain explosions in electricity culverts which have lately occurred in the city. The following full summary of the report, which appeared in the "Electrician" for the 23rd ult., is worth reproduction, as, like the paper read by Dr. Bassett before the Liverpool Section of the Society of Chemical Industry, to which attention was recently directed in the "JOURNAL" (p. 572), it points to other causes than coal gas being responsible for these explosions.

The report states that on May 21 last an explosion occurred in the copper strip culverts in the east end of Union Street. Two manhole lids were blown up, and 8 yards of pavement between the two manholes were lifted; the flagstones being raised from 5 to 6 inches on one side. The two manhole covers were thrown into the air and both broken; and a section of one, falling on the copper strip, caused four or five short-circuits, resulting in some minor explosions. The main explosion, in Mr. Bell's opinion, was due to a service cable falling in on an end box and igniting the coal gas in the culvert. There was gas present in the culverts, and the Gas Department found a leak. The Electricity Department keep four men constantly at work examining culverts and manholes; and the section in which the explosion occurred was inspected on April 20, and the opposite culvert on May 2. No traces of gas were found on either of these dates. Since Jan. 1, 1905, 51 cases of gas leaks were reported by the Electricity Department to the Gas Department. The section damaged had pipes leading in at either end, it being an isolated section of culvert; and on carrying out the repairs Mr. Bell was able to take the opportunity of laying cable and filling in the culvert solid.

As far back as 1895, in view of some explosions which occurred in other towns in connection with their electric lighting installations, the Aberdeen Council consulted Sir Alexander Kennedy, who advised that efficient provision should be made to prevent escapes of gas from the mains. The first explosion in culverts in Aberdeen of which they had any record was on Feb. 15, 1897, which was admitted to be caused by gas. Explosions occurred at various intervals up to the autumn of 1903. In many cases after these explosions, there were distinct traces of coal gas in the culverts, and this was most marked when the effects of the explosion were of a severe nature. The remedies taken at that time were to advise the Gas Department where gas was traceable, and the periodical examination of the culverts. In short, up to that period the opinion was held that a fault in the cable or the blowing of a fuse was the cause of a spark, and that, owing to the presence of coal or sewer gas in the culverts, explosions resulted.

In the autumn of 1903, explosions occurred at much shorter intervals, and, in fact, were of such a nature as to necessitate immediate investigation with a view to their prevention. In the latter explosions it was found that a portion of the electric mains or service cable in the manhole concerned was burned out at the time of the explosion, and the presence of coal gas was not traceable in every case. To investigate the matter thoroughly, a culvert with boxes similar to those used in the streets was built in the electricity works yard, and a series of tests carried out. The Convener and the Gas Engineer were present at most of these tests; and Dr. Matthew Hay interested himself in the matter. In carrying out the tests, in the first place a service cable was built into the manhole and intentionally short-circuited—that is to say, a fault was put on it similar to what might occur in practice, and then the full-pressure current applied; the result being that the cable was immediately burned out and the manhole cover lifted. This at once showed that it was possible for an explosion to occur without the presence of coal or other explosive gas. The next step taken was to prove whether any explosive gas was generated from the insulating material by the intense heat of the fault; and it was found on experiment that a piece of bare copper wire, if short-circuited in the culvert, would create the same explosion, provided electrical energy sufficiently powerful were applied. These experiments tended to show that the explosions were in many cases brought about by the sudden heating and consequent expansion of the air in the manhole or culvert.

Experiments were next carried out with ventilated covers; but it was found that a 6-inch square hole cut in a manhole cover 26 in. by 24 in. was not sufficient to make any appreciable difference in the height to which the cover was lifted. Culverts similar to those that are in use in Aberdeen are in some towns ventilated by means of fans; and where a continuous line of culvert is available, this method is in some respects satisfactory. Union Street culverts, however, were divided up into 24 different sections, having pipes, more or less with filled cables, connecting them. This method of ventilation was therefore impracticable. Experiments were also made with covers bolted down; but this was not found to be satisfactory.

As most of the explosions in 1903 were caused by the failure of a certain type of end connection on service cables (the failure being found to be due to moisture in the culverts attacking the insulation of the cables), a new form of end box was designed to minimize that trouble as far as possible, and some 500 service cables laid into consumers' premises from culverts were altered at considerable expense. There could be no doubt that this alteration had the desired effect, as for well over twelve months after this improvement was made there was not a single manhole explosion brought about by a cable fault.

To sum up the results of the experiments made and the experience gained by the explosions investigated, it was demonstrated first that if a cable failure occurred in a manhole, and sufficiently heavy current were available behind it, the box-lid would be lifted by the sudden heating and expansion of the air; secondly, if there were any sewer or coal gas present in the box, the explosion would be very much more serious. The system of laying electricity supply mains in the city from 1894 to 1896 was that known as bare copper strip drawn into concrete culverts. At present these culverts were laid in 13 streets, and four had culverts under both foot pavements. In all, there were 3½ miles of culverts. Radical alterations in supporting and insulating the copper strip and cables in these culverts had been made three times in the last eight years at considerable expense, and he (Mr. Bell) was unable to suggest anything that would remove the chances of explosion, short of doing away entirely with this type of distribution. It did not appear practicable to prevent coal gas leaking into the culverts from time to time. An interesting fact, Dr. Hay advised them, was that coal gas might, by filtering through a sufficient thickness of earth, lose its odorous constituents and become quite odourless, but would continue to retain its explosive elements. Even if it were possible to exclude gas from the culverts, there was still the danger of a box-lid being lifted by the sudden expansion of air caused by the heat from a cable fault.

Mr. Bell therefore recommended that the Committee should authorize him to replace the existing copper strip culverts by cables laid on the solid system, and that all important manholes on cable work should be replaced by section boxes placed above ground. In carrying out the work, he proposed to lay a distributing cable on the inside of the existing culverts, tapping on consumers as the work proceeded, then to lift the pavement over the culverts and remove road boxes and lay the feeder cables on the solid system inside the concrete culverts, filling in solid with earth before replacing the foot pavement. In estimating the net cost of the work (£8910), Mr. Bell allows for increasing the capacity of distributors and feeders to meet future requirements. Due allowance is made in the estimate for metal, &c., recoverable.

The Council have adopted Mr. Bell's recommendations.

NEW CATALOGUES.

We have received from Messrs. D. Hulett and Co., Limited, of 55 and 56, High Holborn, W.C., a new supplementary catalogue of gas-fittings for the season 1907-8. The fittings illustrated are for inverted and upright incandescent burners, and are of all kinds and prices.

The Lunken Valve Company, of 35, Great Dover Street, S.E., forward an illustrated description and catalogue of their external spring indicators, and other goods. The indicator named is made in three sizes, to suit all purposes, for speeds up to 1500 revolutions per minute.

Messrs. Falk, Stadelmann, and Co., Limited, of Farringdon Road, E.C., have sent us a copy of their new "Veritas" incandescent light list. The catalogue illustrates everything that is required so far as incandescent burners, mantles, glass, and accessories are concerned; but fittings will form the subject of a separate list.

The New Inverted Incandescent Gas-Lamp Company, Limited, of Farringdon Avenue, E.C., have issued their new season's catalogue of "Nico" inverted incandescent gas burners, fittings, arc lamps, &c. A feature, of course, is the regulator for the adjustment of the gas supply to either inverted or upright incandescent burners which was described in the "JOURNAL for July 2 last (p. 20). The complete manner in which the inverted burner lends itself to a combination of the ornamental with the useful, is excellently demonstrated by the numerous illustrations of the Company's fittings.

SHEFFIELD WATER COMMITTEE.

Resignation of Alderman Gainsford.

When the minutes of the Water Committee came up for confirmation at last Wednesday's meeting of the Sheffield City Council, reference was made to a letter from Alderman Gainsford intimating that he would next November resign the chairmanship.

The Lord Mayor (Alderman R. Styring) said he voiced the deep regret of the Council that the state of Alderman Gainsford's health compelled him to resign the chairmanship of the Water Committee, which he had held with so much profit to the community and so much credit and distinction to himself during the last eighteen years. No amount of money would have led to Alderman Gainsford giving greater care and attention to the undertaking; and as the Manager of the concern before it was purchased by the Corporation received £2000 a year, when the income was less than half what it was now, it was clear that Alderman Gainsford had rendered voluntary services to the city for which a company would have been ready to pay something like £30,000 or £40,000. It was a somewhat remarkable feature in his character that, combined with the very great caution which distinguished him, there had at the same time been manifested a very ready inclination and disposition to act on progressive lines. This was well brought out in connection with the undertaking of the Langsett scheme, and perhaps in a more marked way in regard to the laying out of Rivelin Road and the development of the land adjoining, which he considered in time to come would prove of very great advantage to the community. It was also manifested generally in connection with the more recent transaction of the Wyming Brook Estate; and the same thing operated in connection with the enormous scheme now proceeding in the Derwent Valley. When it fell to his (the Lord Mayor's) lot in the very earliest stages, before anything had really been done, to suggest to Alderman Gainsford that an effort should be made to obtain part of that water for Sheffield, he took it up with the very greatest readiness. There was not the least trace of the obstructive or lethargic spirit; and they made journeys together to London before any mention was made of the matter in public, and had interviews with Parliamentary Agents with a view to seeing if steps could be devised for bringing about what they felt would be to the interests of the city. In the later proceedings, too, when the matter got into Parliament, and it became necessary to fight one of the most keenly fought parliamentary contests ever conducted in this country, Alderman Gainsford devoted himself to it with might and main, with the result that to Sheffield was secured a very substantial portion of the water.

Mr. Bennett also eulogized Alderman Gainsford's services, and said they would be be only too glad to keep him as Chairman of the Derwent Water Board as long as he chose to occupy that position.

Electricity Failure at Manchester.—As is quite usual in these cases, it was on a Saturday night that the Manchester electricity supply went temporarily on "strike." Local reports state that scores of tramcars *en route* to and from the out-districts were brought to a standstill; and many shops in the city proper were compelled to close at an earlier hour than usual, owing to the breakdown.

BIRKENHEAD CORPORATION WATER SUPPLY.

The New Water Act.

At a Meeting of the Birkenhead Town Council last Wednesday week, Alderman B. Jones, referring to the Water Act just obtained by the Corporation, said Birkenhead would obtain a supply of water for a long time to come, and by a short Act of Parliament the Glan Alwyn reservoir could be extended. Alluding to the negotiations with Liverpool, he said he had come to the conclusion that, though the Liverpool scheme would have been a little cheaper in the first years, Liverpool and Birkenhead would, sooner or later, have required all the water they could get from their own schemes. In the bargain with Chester, Birkenhead was not in a disadvantageous position. The Corporation began with 26 petitions against their Bill; and at the conclusion there was only one outstanding. With regard to the Alwyn reservoir, quite two-thirds of the land would not be purchased at all; and what was being taken from the landowners was certain easements to go upon their land to construct works. All the Corporation wanted was that the water should be pure that flowed into the reservoirs. In this way they had secured it without buying the land. The speaker went on to refer to the opposition of the Dee Conservancy and the Dee Fishery Board. He said the Corporation did not want Wallasey to be cut out of the Bill, because the two communities had been friendly. Liverpool had an agreement with Wallasey, and did not want to lose the benefit of it. At one time or another, Wallasey would want to get water by means of the Birkenhead Act. Birkenhead had been shut out of Wallasey, but only to this extent—that the Council could not undercut themselves in supplying Wallasey. It was not a serious matter, and Birkenhead had not the slightest objection to this, or to the clause referring to the period when Wallasey could ask for a supply. He concluded by alluding to the cordial relations existing between the members of the Parliamentary Committee of the Corporation, and to the arduous labours of the Town Clerk (Mr. Alfred Gill) in connection with obtaining the Act.

Gladwell's Dustless Road System.

The current number of the "Builder" mentions as a comparatively inexpensive system of making waterproof and dustless roads that which has been employed with considerable satisfaction in the Eton neighbourhood by Mr. Gladwell, the Engineer to the Rural District Council. In one important respect the method of construction differs from that generally adopted by engineers who seek to prevent the penetration of water and the manufacture of dust by applying tar or kindred substances to the surface. Instead of attempting to bind and preserve the metal with the aid of a preparation which has to be worked downwards, Mr. Gladwell uses granite chippings treated with a species of tar from which the light oils have been separated, and covers the tarred bed with granite macadam. The theory, and it is said the practical effect, is that (by the pressure due to rolling) the tar works up from below into the voids between the particles of macadam, binding the whole into a compact mass. Experience at Eton shows that the surface is quite satisfactory, and that roads made in the way described actually cost less, when maintenance is taken into account, than macadam roads, where the so-called binding materials are simply dust and water.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 751.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	20—21	..	5 0 0
268,324	10	,,	7½	Do. 7 p.c.	13½—14½	..	5 3 5
200,000	5	May 15	7	Bombay, Ltd.	6⅞—7	..	5 0 0
40,000	5	,,	7	Do. New, £4 paid	4¾—5¼	..	5 6 8
50,000	10	Aug. 29	14	Bourne- } 10 p.c.	27—28	..	5 0 0
51,810	10	,,	7	mouth Gas } B 7 p.c.	16¾—16¾	..	4 3 7
53,200	10	,,	6	and Water } Pref. 6 p.c.	14½—15½	..	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	247—252	+2	4 19 2
300,000	,,	,,	9½	Do. New	185—190	..	5 0 0
50,000	,,	,,	5	Do. 5 p.c. Pref.	115—120	..	4 3 4
206,250	,,	June 13	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
220,000	Stk.	Mch. 14	11½	Brighton & Hove Orig.	220—225	..	5 0 0
246,320	,,	,,	8½	Do. A. Ord. Stk.	160—165	..	5 0 0
460,000	20	Apl. 11	10	British	41⅞—42⅞	..	4 14 1
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	116—119	..	5 0 10
165,700	,,	,,	4½	Do. do. 3½ p.c.	87—90	..	5 0 0
500,000	10	May 15	7	Buenos Ayres (New) Ltd.	10¾—11¼	..	6 4 5
250,000	Stk.	June 27	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 12	8½	Cagliari, Ltd.	26½—27½	..	6 0 0
100,000	10	June 13	10	Cape Town & Dis., Ltd.	11—13	..	7 13 10
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	8—9	..	5 0 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	50—52	..	5 15 5
50,000	Stk.	June 27	4½	Do. 4½ p.c. Deb. Stk.	94—96	..	4 13 9
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	106½—108½	..	4 12 2
1,443,280	Stk.	,, 29	5⅞	Commercial 4 p.c Stk.	101—106	..	4 18 1
560,000	,,	,,	5	Do. 3½ p.c. do.	98—103	..	4 17 1
475,000	,,	June 13	3	Do. 3 p.c. Deb. Stk.	81—83	..	3 12 3
800,000	Stk.	,,	6½	Continental Union, Ltd.	112—117	..	5 11 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	136—141	..	4 19 3
460,170	Stk.	—	5½	Derby Con. Stk.	123—125	..	4 8 0
55,000	,,	—	4	Do. Deb. Stk.	102—104	..	3 16 11
486,090	10	July 31	12	European, Ltd.	22½—23½	..	5 2 2
354,060	10	,,	12	Do. £7 10s. paid	17½—18½	..	4 17 4
15,182,590	Stk.	Aug. 15	4⅛	Gas- } 4 p.c. Ord.	93—95	..	4 12 7
2,600,000	,,	,,	3½	light } 3½ p.c. max.	86—88	..	3 19 7
3,799,735	,,	,,	4	and } 4 p.c. Con. Pref.	103—106	..	3 15 6
4,193,975	,,	June 13	3	Coke } 3 p.c. Con. Deb.	81—83	..	3 12 3
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	93—93*	+½	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	114—117*	+1½	5 11 1
70,000	10	Apl. 26	11	Hongkong & China, Ltd.	15—20	..	5 10 0
4,940,000	Stk.	May 15	8	Imperial Continental	174—176	..	4 10 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	91—93	..	3 15 3
195,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	110—120	..	5 0 0
306,083	,,	June 27	4	L'rpool Unit'd Deb. Stk.	108—110	..	3 12 9
£			p.c.				£ s. d.
561,000	Stk.	Aug. 29	10	Liverpool United A	218—220	+1	4 10 11
718,100	,,	,,	7	Do. B	160½—161½	..	4 6 8
152,736	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	142—147	..	5 3 8
75,000	5	June 27	5	Malta & Medn., Ltd.	4—4½	..	5 11 1
560,000	100	Apl. 2	5	Met. of } 5 p.c. Deb.	101—103	+1	4 17 1
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	101—103	+1	4 7 5
541,920	20	May 30	3½	Monte Video, Ltd.	10½—11½	..	6 1 9
1,775,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	107—108	..	4 5 7
406,025	Stk.	June 27	3½	Do. 3½ p.c. Deb.	90—91	..	3 16 11
15,000	10	Aug. 29	10	North Middlesex 10 p.c.	19—20	..	5 0 0
55,940	10	,,	7	Do. 7 p.c.	12½—13½	..	5 3 8
300,000	Stk.	Apl. 26	8	Oriental, Ltd.	140—145	..	5 10 4
60,000	5	Sept. 13	7	Ottoman, Ltd.	5⅞—6⅞*	..	5 12 0
398,490	5	May 15	7	Primitiva Ord.	6¾—7¼	..	4 16 7
796,980	5	July 31	5	Do. 5 p.c. Pref.	5—5¼	+⅛	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
1,000,000	10	Apl. 26	8	River Plate Ord.	13—13½	..	5 18 6
312,650	Stk.	June 27	4	Do. 4 p.c. Deb.	93—95	..*	4 4 3
250,000	10	Mch. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	July 1	5	Do. 5 p.c. Deb.	48—50	..	5 0 0
135,000	Stk.	Mch. 14	10	Sheffield A	246—248	..	4 0 8
209,984	,,	,,	10	Do. B	246—248	..	4 0 8
523,500	,,	,,	10	Do. C	246—248	..	4 0 8
70,000	10	June 13	10	South African	15—16	..	6 5 0
6,429,895	Stk.	Aug. 15	5⅛	South Met., 4 p.c. Ord.	119—121	..	4 10 11
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	81—83	..	3 12 3
201,720	Stk	Mch. 14	8	South Shields Con. Stk.	159—161	..	4 19 5
605,000	Stk.	Aug. 15	5⅛	S'th Suburb'n Ord. 5 p.c.	115—118	..	4 13 3
60,000	,,	,,	5	Do. 5 p.c. Pref.	117—120	..	4 3 4
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	120—125	..	4 0 0
502,310	Stk.	May 15	5	Southampton Ord.	105—110	..	4 10 11
120,000	Stk.	Aug. 15	6⅜	Tottenham } A 5 p.c.	120—123	..	5 9 9
398,940	,,	,,	5⅛	and } B 3½ p.c.	100—103	..	5 1 11
149,470	,,	June 27	4	Edmonton } 4 p.c. Deb.	99—101	..	3 19 3
182,380	10	June 13	8	Tuscan, Ltd.	10¼—10⅝	..	7 8 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	100—102	..	4 18 0
193,742	Stk.	Aug. 29	5	Tynemouth 5 p.c. max.	107—109	..	4 11 9
30,000	Stk.	Feb. 14	8	Wands- } A 5 p.c.	—	..	—
255,636	,,	Aug. 15	6⅜	worth } B 3½ p.c.	128—133	..	4 17 9
75,000	,,	,,	5⅜	and } C 3½ p.c.	—	..	—
80,075	,,	June 27	3	Putney } 3 p.c. Deb. Stk.	77—80	..	3 15 0
845,872	,,	Aug. 15	5⅛	West Ham 5 p.c. Ord.	101—104	..	4 18 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
228,300	,,	June 27	4	Do. 4 p.c. Deb. Stk.	100—103	..	3 17 8

Prices marked * are "Ex div."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Works Committee of the Edinburgh and Leith Gas Commission on Monday resolved that on all accounts after the usual accounts in October, the price of gas be increased by 3d. per 1000 cubic feet. The price will then be 3s. Gas supplied through prepayment meters will remain as at present—4s. 3d. per 1000 cubic feet; and the price of gas for public lighting does not come up for re-adjustment till April of next year.

In the Dunfermline Town Council on Monday, the Gas Committee recommended acceptance of the offer of Messrs. R. Dempster and Sons, Limited, of Elland, for supplying and fitting up a coal-breaking machine at the works for £299 15s. Consideration was resumed of plans for new sulphate of ammonia plant and the housing of same, with workmen's room and lavatory attached. The Engineer stated that the probable cost would be about £900; and the Committee agreed to recommend that the work be proceeded with at once. The recommendations of the Committee were agreed to.

The Gas Committee reported to the Hamilton Town Council last Tuesday that the Assessor had fixed the valuation of the gas-works at £5266—an increase of £1226, but that the Manager (Mr. J. Ballantyne) had explained that the valuation was based upon profits, and it appeared to be in order.

In the Wishaw Town Council on Monday, the Gas Committee recommended: (1) That all manufacturers within the burgh be charged the same price for gas used for manufacturing purposes as is charged for power, provided that they put in a separate meter, which will be supplied by the Council at a reasonable rent; (2) that the Gas Manager be instructed to purchase no more gas-cookers in the meantime, without the matter first coming before the Committee, and that no such article be supplied to consumers until their names have been submitted to, and approved of by, the Gas Committee; and (3) that the Council borrow £3000 to meet current capital expenditure. The Committee reported that they had received a deputation from feuars at Netherton, who asked for information as to the price to be charged to private consumers, and that they informed the deputation that it would be 3s. 6d. per 1000 cubic feet, in addition to which there would be payable on ordinary meters a hire of 2s. 6d. per annum; and that, as regarded consumers using prepayment meters, they would be charged at the rate of 3s. 9d. per 1000 cubic feet until such time as they had consumed 10,000 cubic feet. The deputation considered the rate too high, and that, in any event, they thought they should get meters supplied free, and, further, that, in the event of the price of gas within the burgh being reduced from 2s. 11d., a proportionate reduction should be given to consumers in the Netherton district. The Committee informed the deputation that their views would be reported to the Council. The Council, after some discussion, sent the subject back to the Committee, with power; but with instructions that no alteration was to be made in the price of gas, and that ordinary meters were to be charged a rent starting at 2s. per annum, and increasing according to size. Otherwise the recommendations were adopted.

The Arbroath Town Council on Monday considered the annual financial statement which was submitted by Bailie Thomson, the Convener of the Finance Committee. In the course of his statement, he said, dealing with the gas accounts, that their revenue from gas sold amounted to £12,491; from residual products, to £2828; and from other sources, to £92—making a total revenue of £15,411. The expenditure amounted to £11,129, leaving a balance of £4282. They had in hand at the beginning of the past year £639, which made a total balance of £4921. From this there had been paid annuities, £1345; interest on loans, £694; sinking fund, £575; carried to contingency and depreciation account, £1345; and to the Harbour Trustees, £250—together £4209—leaving a balance of £711 at the end of the year. This showed very excellent results, especially when they took into account the very great difficulty the Manager had had on account of the tremendous rise in the price of coal. An annuity of £7 had been redeemed out of the sinking fund, at a cost of £203 19s. 8d.; and a loan of £1180 had been repaid. There was a balance left in the sinking fund of £217. In the contingency and depreciation account, the following amounts had been applied during the year: Scrubbing plant, £794; new boiler, £458; and extension of purifiers, £59—in all £1311. There was left in the fund at the end of the year, £37.

The Gas Committee of the Kilmarnock Town Council on Wednesday recommended that, in view of the large increase in the price of coal, the price of gas be increased by 2½d. per 1000 cubic feet—the increase to take effect about the middle of September, when the next survey commenced. After discussion, it was agreed not to increase the price.

The Monifieth Town Council had before them on Tuesday plans prepared by Mr. A. Morton Fyffe, of Dundee, for the extension of the gas-works. Bailie Fenton, the Convener of the Gas Committee, in moving the adoption of the plans, said that during the few years the works had been under the control of the Town Council, the gas consumed had gone up from 5 to 7½ million cubic feet. The proposed extensions would cost about £1900. It was moved that the matter be delayed till after the November election; but the Council decided that the work should go on.*

The Directors of the Kennoway Gas Company have resolved, on account of the rise in the price of coal, to increase the price of gas by 1d. per 1000 cubic feet, to resume charging for meter-hires, and to reduce the salary of the Manager.

The Selkirk Town Council held a special meeting on Monday to consider as to the adoption of the Burghs Gas Supply (Scotland) Act of 1876. Provost Sim proposed that the date of the meeting of the Council to consider and, if so advised, to confirm the resolution to adopt the

* Some particulars from Mr. Fyffe's report, and a plan showing the proposed extensions, will be given in an early issue.—ED. J. G. L.

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Telegraphic Addresses—STROUD: "WALLER, BRIMSCOMBE." "WEIGHBEAM, LONDON." Telephone Numbers—STROUD: 210 BRIMSCOMBE. LONDON: 2420 (P.O.) CENTRAL.

Agents for Scotland: D. M. NELSON & CO., 53, Waterloo Street, Glasgow.

Act, which he moved, should be Nov. 25. It was, he said, entirely a formal matter, and did not bind them to anything. They had not yet been able to come to any agreement with the Gas Company. They had made an offer (which they presumed the shareholders were considering); and it would be most unwise for the Council to discuss the advantages or disadvantages of that proposal in the circumstances. If the offer were accepted, the very fullest information would be placed before the ratepayers. Mr. Reekie said there was no reason for the motion, seeing there was great opposition in the town to the taking over of the gas-works. He moved that they do not resolve to adopt the Act. Mr. Roberts pointed out that they were only preparing the ground for the submission of the question to the ratepayers. There was no doubt whatever that, at a certain price, the acquisition of the gas-works would be a very good investment for the town. He thought it was unwise for anyone to say that there was great opposition in the burgh. Only two councillors voted for the amendment.

At the meeting of the Denny Town Council on Tuesday, it was reported that the Parish Council had agreed to a deduction of 33⅓ per cent. from the valuation of the gas-works for five years in respect of improvements at the works.

The St. Andrews Gas Company held their annual meeting on Friday —ex-Bailie Aikman in the chair. The Manager submitted the seventy-third annual report, showing a profit on the year's transactions of £1771, which is considerably in excess of last year. There was an increase during the year of 80 consumers. The works and apparatus were in an efficient state of repair, and were thoroughly up-to-date. The Electricity Supply Company had not interfered in any way with their business. It was proposed to pay £3 per share as dividend, free of income-tax, and to carry forward £487 19s. 3d. The Chairman took he opportunity to refer to the great loss the Company had sustained by the death of their Manager, Mr. J. Hall. He thought the report a very satisfactory one. The business had increased in spite of competition, and they had every reason to be satisfied. He referred to the rise in the price of coal, and said that, thanks to the advice of their new Manager, Mr. R. Hall, they had bought early, and secured a stock sufficient to last till May next, when the advance had only reached 2s. 6d. per ton. This should have meant an increase of 4d. per 1000 cubic feet of gas; but the Company had borne one-half the loss, and had only raised the price of gas by 2d. He moved the adoption of the report. A high compliment was paid to the Manager and staff.

Success of the Altham (Accrington) Boring.—We learn that a short time ago water was struck in the boring at the Altham new waterworks, belonging to the Accrington District Gas and Water Board; and a practically unlimited supply of excellent water is assured. The boring had been sunk 117 feet; and when the grey rock, 16 yards thick, had been penetrated 15 inches, the water spurted out, to the delight of Mr. D. C. Dewhurst, the Chairman of the Board, and Mr. Charles Harrison, the General Manager, who happened to be present. The boring through the 48 feet of grey rock is proceeding.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 14.

Sulphate of Ammonia.

The publication of the August export figures, showing a very marked increase upon those for August, 1906, has checked any tendency towards weakness, and parcels out for tender have realized full prices, though second-hand sellers have been offering at less money. The closing quotations therefore remain £11 15s. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. Direct orders, however, are scarce, and the buying is still for the most part for covering purposes. There has been more inquiry for delivery ahead; but buyers still jib at the makers' prices, which remain £12 2s. 6d. per ton for November-April, and £12 5s. per ton for spring months.

Nitrate of Soda.

There is no alteration in the position of this article, spot prices remaining 11s. 1½d. per cwt. for 95 per cent., and 11s. 4½d. for refined quality.

LONDON, *Sept.* 16.

Tar Products.

Markets for tar products are quiet, and there is not very much business doing. Pitch is decidedly easy. Manufacturers are willing to sell at 26s. on the east coast to the end of the year; but in most cases they cannot obtain this figure. In Liverpool, pitch has been offered at 27s. without success. Continental buyers are still holding off the market. In most cases they will only purchase for next season's delivery, and that upon terms which hold out no inducement to dealers to accept same. The South Wales buyers are fully supplied to the end of the present year, and report having bought all over 1908 at low figures. Creosote is steady. London manufacturers ask from 2¾d. to 3d., according to position and quality. In the Midlands, 3d. is the usual figure asked for; while in the North, some quantity of business has been done at 2¾d. for delivery to the end of the year. Benzol, 90 per cent., is quiet. Manufacturers are still willing to sell at 8¼d. to the end of June next, but cannot get any buyers at this figure, while 8d. per gallon is reported to have been accepted for prompt delivery in London, though the majority of manufacturers quote higher figures than this. Benzol, 50-90's, is quiet. Some quantity has been sold in London at prices varying from 8¾d. to 9d. per gallon; but in the North, lower figures have been accepted. There is nothing doing in toluol. Consumers have still very large stocks to work off. Solvent naphtha is quiet. Business has been done in the North at 1s. per gallon; while country makes have been offered in London at 1s. 1d. The majority of London manufacturers ask 1s. 2d. per gallon. Carbolic acid is steady. There are sellers at 1s. 8¼d. for January-June; but the Continental consumers will not pay this figure. Crystals are still quiet and difficult of sale.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d., *ex* works. Pitch, London, 27s.; east coast, 25s. 6d. to 26s.; west coast,

HAVE YOU READ THIS LETTER?

TELEPHONES
—NATIONAL—
GAS OFFICES 234
—MUNICIPAL—
GAS OFFICES 743

ALL REPLIES TO BE ADDRESSED
J D ASHWORTH.
GENERAL MANAGER

Portsea Island Gas Fittings Company Ltd
Show Rooms.
Park Road.

Portsmouth 3rd August 19 07.

Messrs Bland & Co,

London.

Gentlemen,

In reply to your inquiry regarding Blands Inverted Gas Burners I have much pleasure in adding to the testimony of same.

I think it is sufficient recommendation in itself when I say my Company have fixed upwards of 3,000 of these burners in this town during the past year. They are of a decorative design and give a most satisfactory illumination at an exceptionally low gas consumption. Regarding cost of maintenance I have found this exceptionally low, in fact far below that of the up-keep of the ordinary vertical Incandescent Gas Burner. In conclusion I have no hesitation whatever in saying that I can strongly recommend them to Gas Lighting Engineers.

Yours faithfully,

J. D. Ashworth

General Manager.

Facsimile of letter received by Bland & Co., 63, Queen Victoria Street, London, and Manchester.

25s. to 26s. Benzol, 90 per cent., 8d. to 8¼d., casks included; 50-90 per cent., 8¼d. to 9d., casks included. Toluol, 10d. to 10½d., casks included. Crude naphtha, 4d. to 4¼d., naked; solvent naphtha, 1s. to 1s. 1¼d., casks included; heavy naphtha, 1s. 0½d. to 1s. 1½d., casks included. Creosote, London, 2⅞d. to 2⅞d., naked; North, 2⅝d. to 2⅝d., naked. Heavy oils, 3½d. to 3¾d., naked. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8½d., casks included. Naphthalene, £6 10s. to £10 10s., packages included; salts, 35s. to 40s., packages included. Anthracene, "A quality," 1½d. to 1⅝d., casks included.

Sulphate of Ammonia.

This article is quiet, and prices are without any change. The principal London Gas Companies still quote £12 2s. 6d. to £12 5s., but other makes have been sold on Beckton terms at £11 15s., for delivery to the end of the year. In Hull, business has been done at £11 15s. to £11 16s. 3d. for the best makes; but some quantity of discoloured has been sold at £11 12s. 6d. In Leith, business has again taken place at £12; but the majority of manufacturers ask 2s. 6d. over this figure. In Liverpool, the ruling value may be taken as £11 16s. 3d. to £11 17s. 6d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Colliery owners report that the general demand for coal of all sorts is undiminished. At some of the sidings empty waggons are waiting to be filled, and, as one manager said, "We cannot get them filled." The miners seem to be taking matters somewhat indifferently. While there is no lack of work, they seem to be satisfied with three or four days' labour per week. Holidays are taken indiscriminately. At one large colliery, the average absentees number from 60 to 70 per day. The export trade is described as "extraordinary." From Friday last, the advance of another 5 per cent. in wages took effect; and this brings up the average to something like 50 per cent. above the original minimum. Gas coal and cannel are in slow request. "Coalite" seems to be as dead as a door nail. The name is never heard. The average prices at the pits in the Manchester district are: Best house coal 15s. to 16s. 6d. per ton, secondary 14s. to 15s., common 12s. to 13s. 6d., burgy 10s. 6d. to 11s. 4d., best slack 9s. 6d. to 10s. 4d., medium 8s. 6d. to 9s., lower qualities 7s. 9d. to 8s. 4d., coal for shipping 13s. to 14s. 6d. f.o.b. at the tips. Furnace coke is 17s. to 25s.

Northern Coal Trade.

There has been some ease in the northern coal trade, due in part to the delay in the arrivals of steamers, so that the shipment of coal has been retarded, and partly to the milder weather, which has checked consumption in some branches of the trade. Steam coals have been weaker, chiefly through delay in exportation; but there is now a partial recovery. Best Northumbrian steams vary from about 16s. 1½d. to 16s. 4½d. per ton f.o.b. For second-class steams, the quotation is from about 15s. to 15s. 6d., and steam smalls are rather scarce at from about 10s. to 10s. 6d. In the gas coal trade, the demand is growing heavier, more especially for home use; and the exports of gas coal have been far above the average this season. Good Durham gas qualities vary from 14s. 6d. to as high as 16s. per ton f.o.b.; but there is some variation in prices when the delivery is well forward. As to new contracts, there are not so many of these to record; but a sale, for delivery over next year, is reported at about 14s. 6d. per ton f.o.b., though the quantity is not stated. In the coke trade, there is a good demand. Gas coke feels the benefit of this—the enlarged production being well taken up; and the price is about 19s. 6d. to 20s. per ton f.o.b. Some inland gas-works have slightly increased the price of coke for domestic use.

Scotch Coal Trade.

The market, particularly the foreign section of it, continues to be very active, and prices for all sorts are firm. The prices quoted are: Ell 14s. 6d. to 16s. 6d. per ton f.o.b. Glasgow, splint 15s. to 15s. 6d., and steam 14s. to 14s. 3d. The shipments for the week amounted to 324,323 tons—a decrease of 655 tons upon the preceding week, but an increase of 42,453 tons upon the corresponding week of last year. For the year to date, the total shipments have been 10,058,583 tons—an increase of 666,887 tons upon the corresponding period of 1906.

Alleged Nuisance from a Gas-Works Ended.

Dr. T. Orme Dudfield, Medical Officer of Health for Kensington, in his annual report, which has just been issued, says that complaints are received every year of effluvium nuisance from the gas-works at Kensal Green. There could, he adds, be no doubt as to the genuineness of the complaints, which obtained confirmation from Willesden. The inhabitants of that district suffered when Kensington people had no ground for complaint, and *vice versâ;* the incidence of nuisance varying with changes in the direction of the wind. That the cause of nuisance was more or less under control, would, he says, appear from the intermittency of the complaints, and as the smells were at times not perceptible to any noxious degree in the vicinity of the works. In March, 1906, several complaints were received from (among others) residents in St. Quintin Avenue and other streets in the vicinity. Written intimations of nuisance were served on the Secretary of the Gaslight and Coke Company, and also on the Resident Engineer, who attributed the offensive effluvia to the defective condition of one of the scrubbers, then under repair—the top having been taken off for the purpose. It was stated that the lime purifiers were emptied when necessary between 2 and 3 a.m.; that every effort was made to reduce any offensive smells to a minimum; and that nuisance from this cause would cease in a few weeks, when the process of purification of the gas by lime would come to an end, and oxide of iron only be used for the purpose. The change having been brought about, no further cause for complaint arose; and therefore there was no occasion to give effect to the directions of the Public Health Committee to institute proceedings.

PARKINSON'S GAS-FIRES.

NEW DESIGNS 1907-8.

The "TOPAZ"

With Patent Gas and Air Adjuster.
Boiling Burner fitted at top with separate Cock.
Single Row Fuel, Registered Design.

Particulars of other New Designs on application to

PARKINSON AND W. & B. COWAN, LTD.
(PARKINSON BRANCH),
COTTAGE LANE, CITY ROAD, LONDON.
BELL BARN ROAD, BIRMINGHAM.

Electric Lighting Complaint at Dudley.

The Dudley Town Council have passed a resolution requesting the Streets, Tramway, and Lighting Committee to report as to the best methods for improving the public lighting of the borough. The member who introduced the motion remarked that the complaints respecting the present system of lighting the main roads with arc lamps were so general, and the defects of this method of illumination so obvious, that the time had arrived when the whole question should be dealt with by the Council. So far as the arc lamps in the Market Place were concerned, it appeared to him that they were more in the nature of illuminants of the sky and the housetops than of the thoroughfare itself. These arc lamps were not only unsatisfactory in regard to their action, but also in respect of their distribution. In some parts of the borough, if one of them went out, there was a space of about a quarter of a mile with no intervening illuminant. If the borough was to be lighted by electricity, it was important there should be a thoroughly good system in operation. He suggested that, in place of the existing arc lamps, there should be substituted smaller ones, using about half the current. These smaller lamps could be placed on the tram-poles, and be fed by two distinct cables; so that if one became fused, half the lamps would continue alight. They could also be duplicated at important junctions, and so ensure a light always at dangerous points. The cost of carrying out the scheme he proposed would be £1200, representing an annual charge in connection with interest and sinking fund of not more than £90. This, he thought, was very small when compared with the great public benefits that would be derived from the alteration.

Gas Explosion at Hampstead.—As the result of a gas explosion in a house at South Hill Park, Hampstead, Mr. Lambert, the occupier, was so severely burnt that he had to be removed to the hospital; while numerous windows were broken. On its way to the spot, the steam fire-engine skidded and overturned; and two firemen were injured.

Mishap at Highgate Reservoir.—The reservoir which has just been constructed for the Metropolitan Water Board in the valley between Fortis Green and Highgate Woods, and which is intended to supply with water from Staines the large population which is growing up in this district, has been the scene of a mishap the remedying of which will entail considerable outlay. The building of the reservoir was commenced during the time of the New River Company; and on its completion recently, it was examined and handed over by the Contractors to the Board. A few days afterwards, however, one of the walls gave way, owing to the pressure of the earth on the outside. It is conjectured that if the reservoir had been full of water, the weight would have counterbalanced the pressure of the earth on the other side, and the mishap would not have occurred. The wall is to be rebuilt at a cost of between £6000 and £7000; and a commencement has been made with the work of demolishing the damaged wall, by means of charges of dynamite.

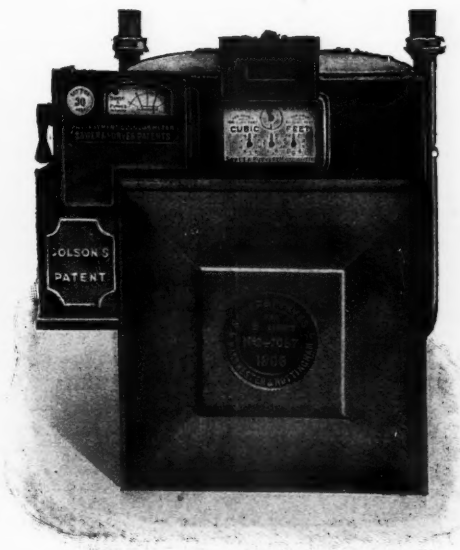
Welsh Water for London.—A correspondent of the "Engineer" writes: In a journey through the Rhayader district, where the great watershed for Birmingham is situated, I found that out of all the thousands who were employed there for twelve years, only 130 men remain, and these will very likely be lessened. At one time over £2000 circulated fortnightly in wages; and the withdrawal of this has told seriously on the district. It was, in the opinion of Sir Alexander Binnie, that from this neighbourhood London would get its supply; and there is a rumour now current that this is not abandoned. The watershed suggested impinges on the Towy, the Irvor, the Wye, and the Usk. But the matter is still one of theory; and I cannot learn of any more practical step than taking the rainfalls and the height of floods at certain seasons. London may be wealthy enough for any expenditure; but the difference in the estimate of the property value of the Bala and the Radnorshire district must be very large. The latter, with its mineral springs, is of exceptional value.

Bradford and the Gas-Works of the Ripley Trustees.—The Bradford City Council, on the recommendation of the Gas Committee, have decided to purchase for £15,000 from the Ripley Trustees their private gas-works at Ludlam Street. Of the production of these works, 89 per cent. is used for trade, and 11 per cent. for domestic purposes. We learn from the "Yorkshire Observer" that nearly fifty years have elapsed since Sir H. W. Ripley, anticipating the needs of the large estate that he was developing, had a gas plant laid down in Ludlam Street, which has since supplied gas, not only for domestic and industrial purposes, but for lighting streets on the estate. Situated within easy access of a coal depôt, and with an annual production of about 40 million cubic feet of gas, the undertaking is one of considerable value; and seeing that the larger portion of the estate belonging to the Ripley Trustees is still undeveloped, this value in the course of years would no doubt be greatly enhanced. At various times negotiations have passed between the owners and the Gas Committee of the Corporation with a view to the purchase of the works by the City Council.

Brampton and the Geltsdale Water Scheme.—At the last meeting of the Brampton Rural District Council, it was stated that a settlement had been arrived at in regard to the action brought by the Council against the Carlisle Corporation for damage done to the roads in the Brampton district on account of the extraordinary traffic due to the Geltsdale water scheme. The Chairman (Mr. W. Dobson), in making the announcement, said that negotiations had been going on between the Solicitors to the Corporation and the two Contractors, with regard to the claim. The Committee had not prepared a written report; but they were happy to say they had made a very satisfactory settlement. The defendants had to pay to the Council £1100, together with the taxed costs. This was to cover the claim for damages done to the roads during the existence of the present contract, which was not concluded. The Council would remember that the expenditure was £1673; and the claim was put in at two-thirds of this amount, which, roughly, was £1100. They had not altered their position at all; and finally the Solicitors acting on behalf of the two Contractors jointly with the Corporation had agreed to their terms. The Council at once confirmed the settlement.

Sawer & Purves,
NELSON METER WORKS,
MANCHESTER.

PREPAYMENT METERS



WET AND DRY

Fitted with Colson's Patent Cash Box if required.

Sawer & Purves,
RADFORD METER WORKS,
NOTTINGHAM.

Tees Valley Water Board Act.

The Tees Valley Water Board have approved of a long report by the Finance Committee on the Tees Valley (Consolidation) Act, 1907. The principal item of interest in the report was that relating to the sale of water to large consumers at 3d. or 3½d. per 1000 gallons; and it was stated that, after several meetings between a Committee of the Board and a Committee appointed by the large consumers, it was arranged that until Dec. 31, 1914, or the earlier completion of the Grassholm reservoir, the charge to large consumers inside the borough of Middlesbrough should be 4⅛d. per 1000 gallons, and to those outside the borough 4¾d. After that date, the charge to large consumers inside the borough is to be 4d. per 1000 gallons, and to those outside 4½d. The Committee representing the large consumers proposed a sliding-scale terminating, in a certain number of years, at 3d. per 1000 gallons inside the borough and 3½d. outside; but they ultimately accepted the proposals embodied in the Act, which provided that any surplus revenue in any year had to be applied to the reduction of the charges to the domestic consumers only. An estimate of the financial position of the Corporations of Middlesbrough, Stockton, and Thornaby under the provisions of the Act showed that if the Act had been in force during the whole financial year ending March 31, 1908, there would have been a surplus for discount or reserve fund of £8463; whereas provision was made in the estimates to meet a deficit of £25,575. At the meeting of the Board at which the matter was considered, Sir Samuel Sadler said the new Act meant a perfect revolution in the conduct of the Board's affairs. They were now about to convert a loss into a profit. The ratepayers would have great cause for congratulation that they were to be relieved from providing many thousands of pounds a year towards the water undertaking. Their General Manager, Mr. D. D. Wilson, had, in connection with the Bill, surpassed himself in the way he had conducted affairs. He moved a vote of thanks to Mr. Wilson for his services; and this was carried.

Sale of Gas Stock.—At a local auction sale, Mr. Frank Ruff a few days ago disposed of £7500 of "B" stock in the Long Eaton Gas Company. After the conditions of sale had been read by Mr. George Stevenson, the Engineer and Secretary of the Company, the stock was offered in lots of £100 each. The first two lots realized £110 each, the second two £105 each, and the rest were knocked down at £100.

Interest on Local Loans.—The Lords Commissioners of His Majesty's Treasury gave notice in last Friday's "Gazette" that, in pursuance of the powers conferred upon them by the Public Works Loans Act, 1897, they have been pleased to direct, by their minute of the 9th inst., that on loans advanced out of the Local Loans Fund on the security of local rates subsequent to the date of that minute there shall be chargeable, in lieu of the rates of interest fixed by the Treasury minute of March 3, 1904, the following rates of interest: Not exceeding thirty years, 3½ per cent. per annum; and not exceeding fifty years, 3¾ per cent. per annum.

Sandiacre Gas-Works to be Purchased.—It is stated that negotiations which have been going on for some time between the Long Eaton and Sandiacre Gas Companies for the purchase by the former of the Sandiacre undertaking have been concluded; the Long Eaton Company having secured the Sandiacre Company as a going concern.

Price of Gas at Cobham.—Last Tuesday, a public meeting was held to protest against the increased charges of the Cobham Gas Company. Previously the gas was supplied at 4s. 9d. per 1000 cubic feet; and this has now been raised to 5s. It was decided to address a letter to the Gas Company complaining of the increase, and further threatening to use another source of illuminant as much as possible should the price be maintained.

The Kinder Water-Works at Stockport.—The Stockport Town Council, on the recommendation of the Water Committee, have decided to complete the Kinder Water Scheme by means of direct labour, instead of again placing it in the hands of a Contractor. As the result of reports made by their Engineers (Messrs. Hill and Son), and of their own observations, the Committee are convinced that it will be possible to make a water-tight dam in the valley; and the work is to be pushed on with all speed, so that if possible it may be finished within the period stipulated in the Act.

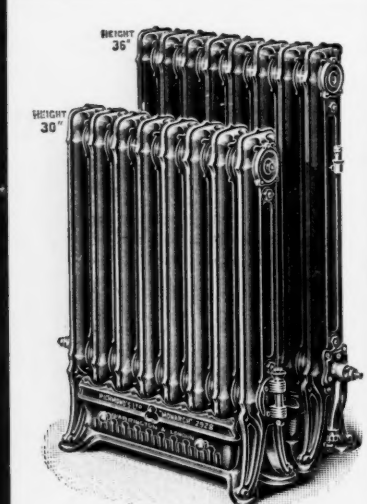
Charges for Water at Yeovil.—It was decided by the Yeovil Town Council last week to revise the charges for water supplied by meter within the borough, and to make the rate 2s. 6d. for the first 1000 gallons, and 1s. for each succeeding 1000 gallons used per quarter—the present extra charge for consumption in excess of the average quantity during the summer months to remain in force. It was stated that under the old scale the large consumers paid considerably less for water than the small ones, and that the idea of the alteration now proposed was to make the rate uniform all round. Instead of realizing a profit last year, the sum of £653 had to be drawn from the rates to make the income balance the expenditure.

The Lighting of Tiverton.—A report on the lighting of the town was presented to the Tiverton Town Council yesterday week by Mr. J. Siddalls, the Surveyor. It was suggested that all the lamps be lighted throughout the year, but that about 40 of the 103 full-service lamps and 50 of the short-service lamps be extinguished at 11 o'clock each night. By this means, a saving of about £154 would be effected, but the cost of the extra turning off would be about £50, leaving a net reduction of about £100. The Surveyor and the Gas Manager (Mr. C. Jeffery) had also considered the question of incandescent lighting, and recommended that the whole of the lamps be converted to the incandescent system and fitted with automatic controllers. The cost of the conversion was estimated at £280; and the use of the controllers would save the £50 a year for the turning off of the lamps at 11 o'clock. The saving by the use of controllers would repay the whole cost of the installation in four years. Alderman Thorne thought that it would be a mistake to extinguish every alternate lamp at 11 o'clock, and that difficulties might arise with the police in watching business premises. The Council, however, adopted the report.

SOME **LONDON**

Supplied

Richmond's Gas-



Single Column.

GOVERNMENT BUILDINGS.
Victoria and Albert Museum, South Kensington.
H.M. Office of Works.
H.M. War Office.
H.M. Horse Guards.
H.M. India Office.
H.M. Naval Department, Greenwich.

THEATRES.
Covent Garden Theatre.
Shaftesbury Theatre, Shaftesbury Avenue.

CHURCHES, CHAPELS, ETC.

Baptist Church, Ashwin Street, Dalston	14 supplied.
New Jerusalem Church, Palace Gardens Terrace, Kensington	11 "
St. George's Church, Aubrey Walk, Kensington	11 "
Roman Catholic Church, Homerton	8 "
Percy Road Chapel, Kilburn	6 "
Baptist Church, Westbourne Grove	7 "
Chapel, High Street, Stoke Newington	3 "
Synagogue, Wellington Road, Stoke Newington	3 "
Christ Church, Harlesden	2 "
Presbyterian Church, Harlesden	2 "

Baptist Chapel, Wordsworth Road, Stoke Newington.
St. James' Church, Paddington.
Synagogue, Kensington Palace Road.
Presbyterian Church, Upper George Street, Bryanston Square.

ADVERTISEMENT OF THE RICHMOND GAS STOVE AND METER CO., LTD.

Proposed Gas and Water Works Purchase at Flint.—The Flint Town Council, at their last meeting, discussed a motion: "That the question of the purchase of the Gas and Water Company be considered; and that a Sub-Committee be appointed to go into the matter." One member suggested the addition of the words "and the erecting of an electric light plant;" and in this form the resolution was carried. A Sub-Committee were thereafter appointed to deal with the subject.

Water Question at Maryport.—A meeting held by the Maryport Urban District Council recently, in order to consider the new water scheme, ended in a *fiasco*. The Council had decided to double the main from the River Derwent at Cockermouth, at an estimated cost of £20,000. The decision caused considerable opposition among the ratepayers, who asserted that the scheme was being "rushed." This attitude led some of the councillors to modify their views; and the previous meeting of the Council broke up without the minutes of the Parliamentary Committee being confirmed. At the adjourned meeting, in view of a notice of motion to abandon the scheme, one by Mr. Maughan to confirm the minutes of the Committee found no seconder.

A Possible Paris Gas Strike.—The Paris correspondent of the "Daily Telegraph" says that the men at the Gennevilliers Gas-Works are on strike; and there is some dread that the movement may extend to Paris, owing to the usual appeal to "solidarity." Experts in these matters are not, however, inclined to share this apprehension, or to fear that the "*Ville Lumière*," which, on a memorable occasion, was bereft of its electric light, will be thrown into partial darkness by all the gas employees ceasing work. It is thought that, even if such an extreme course was proposed, the great majority of the men would turn a deaf ear to it. But, as may be remarked, this is simply a matter of opinion. No one took the threatened electric strike seriously until it became an accomplished fact; and history has a way of repeating itself which is not always pleasant.

Exmouth Water Supply.—In consequence of the serious depletion of the quantity of water in the reservoir, to which reference was made in the "JOURNAL" last week, the Exmouth Town Council have been using the fire-engine to pump water from the Yettington Brook. The owner of the mill which is worked by this stream is said to have threatened to apply for an injunction, and it is probable that legal proceedings of some kind will follow. But the District Council appear to have had practically no choice in the matter. The water in the reservoir had sunk to a level below the outlet to the filter-beds; and though the supply was restricted to seven or eight hours a day, it could only be maintained at all by supplementing the ordinary means of supply by drawing upon some other source. The supply from Yettington Brook saved the town from an absolute water famine. According to the town authorities, there is plenty of water there for their requirements, and for the use of the mill. The quantity abstracted by the Council has been limited by the capacity of the fire-engine and of another engine which is used to lift the water to the level from which it can flow into the filter beds.

Public Lighting of Waltham Cross.—At the meeting of the Waltham Cross Urban District Council last week, a tender was received from the Gas Company for the lighting of the public lamps; the prices being £4 15s. 6d. for ordinary lamps and £9 15s. per annum for Lucas lamps, or 5s. more than last year in each instance. In an accompanying letter, it was explained that the higher prices were due to the increased cost of coal. At the same time, it was stated that, if the Council would enter into a contract for five years, and would give their consent to the Company applying to the Board of Trade for the adoption of the "Metropolitan" argand No. 2 burner for testing purposes, in place of the present No. 1 argand, the Directors would instal automatic lighting apparatus; and the saving thereby effected would allow the Company to carry out the contract at the old price. The matter was referred to the Committee.

Lewes Gas Company.—The report for the half year to June 30, which was adopted at the ordinary general meeting of the Lewes Gas Company, stated that the revenue account showed a profit for the six months of £1524. After providing for interest on mortgages, the balance of net revenue, as shown in the profit and loss account, was £2893. The Directors recommended the declaration of dividends for the half year at the rate of 5 per cent. upon the original capital stock and at the rate of 3½ per cent. upon the additional capital stock. The Chairman (Mr. C. R. Kemp) referred to the satisfactory character of the report, and pointed out that Mr. E. A. Jones had been appointed Assistant Manager at the works. He said he had been in the service of the Company for many years, and was a capable and efficient man, so that the Directors thought it was very desirable to appoint him to the office. The Directors and the staff were heartily thanked for their services; and the Chairman, the Secretary (Mr. H. J. Hillman), and the Manager (Mr. Levi Monk) returned thanks.

Sheffield Gas Company's Reserve Fund.—The City Councils' Nominee Directors on the Board of the Sheffield United Gaslight Company have prepared a report in which they state that, though the Company's reserve fund stands at the maximum amount allowed by the Gas Acts, there is carried forward a further sum on revenue account of £98,234, making a balance, with the reserve fund, of no less than £185,182, or £11,086 more than double the statutory reserve. They refer also to the fact that after the recent Corporation Bill had passed the Lords, a petition was presented against it in the Commons by the Company. The petition was sealed with the seal of the Company; and yet the Nominee Directors were absolutely unaware of the intention of the Company to present the petition. They were never informed thereof, nor were the Board consulted. After the presentation of the petition, the Board were at their next meeting informed by the Secretary of the action that had been taken; and such action was approved, after a protest from one of the Nominee Directors. The Nominee Directors are of opinion that such action is contrary to the intention of the Company's Act, and that any such proceeding as the affixing of the seal to important documents should be submitted to the Board before any action is taken.

BUILDINGS

with

Steam Radiators.

SCHOOLS, INSTITUTES, ETC.

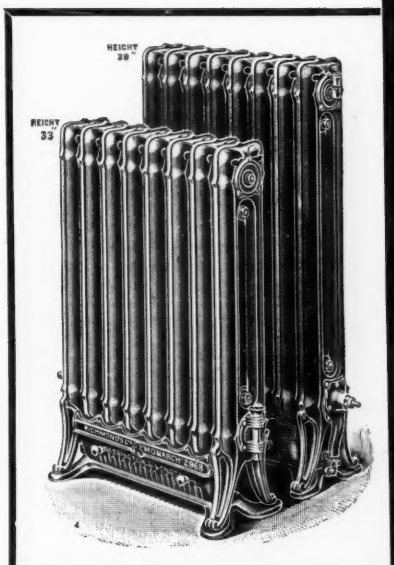
St. Clement's Schools, Bloomsbury	6 supplied
Holy Trinity Schools, Islington	3 "
All Saints Schools, Stoke Newington.	
St. Saviour's School, Paddington.	
St. Saviour's Institute, Hogarth Place, Kensington.	
St. Matthias Institute, Kensington	2 "
Town Hall, Finchley, N.W.	14 "
Victoria Memorial Hall, Kensington	3 "
Mission Hall, Church Row, Fulham	3 "
People's Hall, Goodson Road, Willesden.	
Salvation Army Hall, Flash Walk, Hampstead	2 "
Orphan Working Home, Hampstead	10 "

HOTELS, CLUBS, ETC.

Lancaster Gate Hotels, Ltd., 74, Lancaster Gate, Paddington.
Cosmopolitan Club, 32, Dover Street.
Bath Club, Ltd., 34, Dover Street.
"Butcher's Arms," York Road, Holloway.
"The Enterprise," 35, Walton Street, Chelsea.

COMMERCIAL HOUSES, SHOPS, OFFICES, ETC.

Waring and Gillow, Short's Gardens, Drury Lane.	52 supplied.
Waring and Gillow, 70-78, Oxford Street	36 "
Co-operative Printing Society, Tudor Street	20 "
Waring and Gillow, 110, High Street, Marylebone	14 "
Cundell, Eve & Co., 10-14, Underwood Place, City Road	6 "



Double Column.

London Offices and Showrooms: 132, QUEEN VICTORIA STREET, E.C. *General Offices and Works:* WARRINGTON, ETC.

R. Laidlaw and Son (Edinburgh), Limited.—This is the title of a joint-stock Company just registered in Edinburgh, with a capital of £50,000 in £10 shares, to purchase from R. Laidlaw and Son, Limited, of Glasgow, the Edinburgh branch of their business (carried on at Simon Square, Edinburgh), and carry on the business of gas and water meter manufacturers, brassfounders, &c. The first Directors are T. K. Laidlaw, W. K. Laidlaw, and A. Young.

Messrs. James M'Kelvie and Company, colliery proprietors and coal merchants, removed their Edinburgh offices yesterday from the Haymarket to No. 17, Rutland Square.

The Seaford Gas Company, Limited, have placed an order with Messrs. Robert Dempster and Sons, Limited, of Elland, for a new retort-bench, on Waddell's system, complete with all retort mountings, and Scott and Dempster's patent travelling platform over the subway. The work has to be carried out under the supervision of the Company's Manager, Mr. L. D. Mosley.

The electric lights all went out during the performance of the play with which the Cheltenham Theatre was recently re-opened for the autumn season. Fortunately, the performers were resourceful, and kept the audience amused; while the band helped to save the situation by lighting gas-jets in the orchestra, and the big gas sunlight in the roof was turned up. So the performance went on until the electric light was resumed.

The Harrogate Corporation having approached the Local Government Board with a view of securing a longer period than 35 years for the repayment of their water-works loan, a reply has been received from the President, the Right Hon. John Burns, stating that he does not see any reason for extending the period. A member of the Council, on this announcement being made, remarked that it was time all corporations combined to influence Parliament to alter the law.

A joint-stock Company, entitled "Howelite Limited," has just been registered (with a capital of £14,650, in 14,000 ordinary shares of £1 each and 13,000 deferred shares of 1s. each) to acquire the patents and rights for the United Kingdom and Europe in respect of an invention relating to incandescent burners; to adopt an agreement with F. B. Mills; and to carry on the business of manufacturers of and dealers in incandescent gas-fittings and accessories, &c.

The results of the Staveley Coal and Iron Company's working for the past twelve months show that the net profit, after providing for the dividend on the preference shares and the interest on the debentures, amounts to £167,651. The balance of profit brought forward from last year was £28,287, making a total of £195,939. In February, an interim dividend of £5 per share on the "A" and "C" shares and 16s. 8d. per share on the "B" and "D" shares was paid. The Directors now recommend a final dividend for the year of £7 10s. per share on the "A" and "C" shares and £1 5s. per share on the "B" and "D" shares, which will leave a balance of £33,022.

LEAFLETS FOR DISTRIBUTION.

"ILLUMINATING TRUTHS FOR HOUSEHOLDERS."

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
No. 2.—"The Cleanliness of Illuminants: The Eyesight."
No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.
Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

FOREMAN OF PURIFICATION DEPARTMENT. Croydon Gas Company.
STOKER. Denbigh Gas and Coke Company.

Gas Literature Wanted.

L. P. LOWE, 1214, Polk Street, San Francisco.

Situations Wanted.

ENGAGEMENT IN GAS OR WATER OFFICE. J. F. Watson, Soham, Cambs.
GAS-FITTER, METER READER, &c. S. Wait, Swindon.
REPRESENTATIVE (GAS AND WATER). No. 4813.
SITUATION IN GAS-WORKS. No. 4836.

Plant, &c., for Sale.

FOUR CAST-IRON PURIFIERS, &c. Waterside Mills, Hadfield.

Plant, &c., Wanted.

STATION-METER, GOVERNOR AND PURIFIERS (SECOND-HAND). No. 4838.
TELESCOPIC GASHOLDER. Midland Coal, Coke, and Iron Company, Limited, Newcastle, Staffs.
THREE PURIFIERS (SECOND-HAND). W. Metcalf, Limited, Church, Lancs.

Patents for Sale.

RELATING TO GAS-BURNERS.

Company Meeting.

BRITISH GASLIGHT COMPANY, LIMITED. Offices, Sept. 25. 12 o'clock.

Stocks and Shares.

GREAT YARMOUTH GAS COMPANY. Sept. 26.

TENDERS FOR

Coal.
BELFAST GAS DEPARTMENT. Tenders by Oct. 3.

Coke.
WANDSWORTH AND PUTNEY GAS COMPANY. Tenders by Sept. 23.

Meters.
GLASGOW GAS DEPARTMENT. Tenders by Sept. 24.

Oxide (New and Spent).
BIRKENHEAD CORPORATION. Tenders by Sept. 19.
SALFORD GAS DEPARTMENT. Tenders by Sept. 26.

Tar and Liquor.
BLACKPOOL GAS DEPARTMENT. Tenders by Sept. 21.
COLWYN BAY AND COLWYN GAS DEPARTMENT. Tenders by Sept. 24.
ISLE OF THANET GASLIGHT COMPANY. Tenders by Sept. 19.
MARKET HARBOROUGH GAS DEPARTMENT. Tenders by Sept. 21.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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